CLERK'S COPY

# TRANSCRIPT OF RECORD

## Supreme Court of the United States

OCTOBER TERM, 1943

## No. 262

THE GOODYEAR TIRE & RUBBER COMPANY, INC. AND GENERAL DRY BATTERIES, INC., PETITIONERS,

*vs.*

RAY-O-VAC COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SEVENTH CIRCUIT

**PETITION FOR CERTIORARI FILED AUGUST 13, 1943.**

**CERTIORARI GRANTED OCTOBER 18, 1943.**

IN THE

# Supreme Court of the United States

OCTOBER TERM, A. D. 1942.

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No. 262

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THE GOODYEAR TIRE & RUBBER COMPANY, INC.,
GENERAL DRY BATTERIES, INC.,
*Petitioners,*

*vs.*

RAY-O-VAC COMPANY,
*Respondent.*

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ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SEVENTH CIRCUIT.

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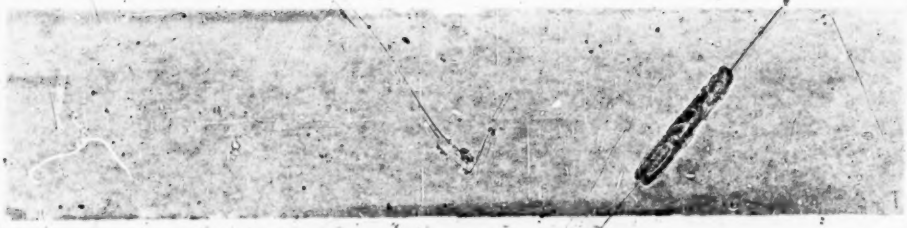

TRANSCRIPT OF RECORD

# In the United States Circuit Court of Appeals For the Seventh Circuit

No. 8118

RAY-O-VAC COMPANY,
*Plaintiff-Appellee,*

*vs.*

THE GOODYEAR TIRE & RUBBER COMPANY, INC.,
*Defendant-Appellant,*

AND

GENERAL DRY BATTERIES, INC.,
*Defendant-Intervenor-Appellant.*

Appeal from the District Court of the United States for the Eastern District of Illinois.

THE GUNTHORP-WARREN PRINTING COMPANY, 310 WEST JACKSON, CHICAGO

TRANSCRIPT OF RECORD FILED SEPT. 25, 1942.
PRINTED RECORD.

In the

# United States Circuit Court of Appeals

## For the Seventh Circuit

No. 8118

RAY-O-VAC COMPANY,
*Plaintiff-Appellee,*

*vs.*

THE GOODYEAR TIRE & RUBBER COMPANY, INC.,
*Defendant-Appellant,*

AND

GENERAL DRY BATTERIES, INC.,
*Defendant-Intervenor-Appellant.*

Appeal from the District Court of the United States for the Eastern District of Illinois.

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1 Pleas in the District Court of the United States Placita.
Within and for the Eastern District of Illinois at a Special Term Thereof, Begun and Held in the United States Court Room in the City of Danville, in Said District Before the Honorable Walter C. Lindley, Judge of Said Court, on the First Monday of June in the Year of Our Lord One Thousand Nine Hundred Forty Two and for the Independence of the United States of America, the One Hundred and Sixty-Sixth Year.

D. H. Reed,
*Clerk.*

Ray-O-Vac Company,
*Plaintiff,*
*vs.*
The Goodyear Tire & Rubber Company, Inc.,
*Defendant.*
} Civil Action No. 240-D.

Be It Remembered that heretofore, to-wit: on the 12th day of January, A. D. 1942, came Chritton, Wiles, Davies & Hirschl, and Lindley, Jones, Grant & Sebat, as Attorneys for Ray-O-Vac Company, Plaintiff herein, and filed in the office of the Clerk of the United States District Court for the Eastern District of Illinois, a Complaint, in a cause entitled Ray-O-Vac Company *vs.* The Goodyear Tire & Rubber Company, Inc., Civil Action No. 240-D, which said Complaint was and now is in words and figures following, to-wit:

Filed Jan. 12, 1942. 2

IN THE UNITED STATES DISTRICT COURT

For the Eastern District of Illinois.

Ray-O-Vac Company, *Plaintiff*,
*vs.*
The Goodyear Tire & Rubber Company, Inc., *Defendant*.
} Civil Action No. 240-D.

## COMPLAINT FOR INFRINGEMENT OF PATENT.

(Filed Jan. 12, 1942. D. H. Reed, Clerk.)

Bill of Complaint of Plaintiff, Ray-O-Vac Company, against Defendant, The Goodyear Tire & Rubber Company, Inc.

1. Plaintiff alleges that it is a corporation duly organized and existing under the laws of the State of Wisconsin and that it has its principal place of business at Madison, Dane County, Wisconsin, and that defendant, The Goodyear Tire & Rubber Company, Inc., is a corporation organized and existing under the laws of the State of Delaware and has a place of business at Indiana Avenue and Oak Street, Kankakee, Kankakee County, Illinois, within the Eastern District of Illinois, said place of business being operated under the name and style of "Goodyear Service, A Division of Goodyear Tire & Rubber Company, Inc.".

2. This is a suit between citizens of different States in which the amount involved, exclusive of interest and costs, exceeds the sum or value of $3,000.00 and is a suit under the patent laws of the United States for infringement of Letters Patent.

3. On April 23, 1940, United States Letters Patent No. 2,198,423 were duly and legally issued to plaintiff for an invention in a leak-proof dry-cell of the type used in flash light casings; and since that date plaintiff has been and still is the owner of those Letters Patent.

3 4. Defendant has been and still is infringing those Letters Patent by selling in its place of business in Kankakee, Illinois, dry-cells embodying the patented invention, and will continue to do so unless enjoined by this Court.

5. Plaintiff has placed the required statutory notice on leak-proof dry-cells manufactured and sold by it under said Letters Patent and has given written notice to defendant of its said infringement, but defendant has continued to infringe since receiving said written notice.

Wherefore, plaintiff prays a preliminary and final injunction against further infringement by defendant and those controlled by defendant, an accounting for profits and damages, and an assessment of costs against defendant.

Ray-O-Vac Company.
By (Signed) Chritton, Wiles, Davies & Hirschl,
*Its Attorneys.*

(Signed) Bernard A. Schroeder,
*Of Counsel for Plaintiff,*
2800 Board of Trade Building,
Chicago, Illinois.
(Signed) Lindley, Jones, Grant & Sebat,
*Attorneys for Plaintiff,*
305 Adams Building, Danville, Illinois.

Endorsed: In the United States District Court. • • (Caption—240-D) • • Complaint for Infringement of Patent. Lindley, Jones, Grant & Sebat, 308 Adams Building, Danville, Illinois. Chritton, Wiles, Davies & Hirschl, Attorneys at Law, 28th Floor, Board of Trade Building, 141 W. Jackson Boulevard, Chicago, Ill.

4 And afterwards, on to-wit: the 4th day of February, A. D. 1942, there was filed in the office of the Clerk of said Court in said cause, a Stipulation, which said Stipulation was and now is in words and figures following, to-wit: Filed Feb. 4, 1942

5 IN THE UNITED STATES DISTRICT COURT.
• • (Caption—240-D) • •

## STIPULATION.

(Filed Feb. 4, 1942: D. H. Reed, Clerk.)

It is hereby stipulated and agreed by and between the parties hereto, this Honorable Court consenting:

1. That General Dry Batteries, Inc., an Ohio Corporation, being the manufacturer of the alleged infringing

devices, may intervene as a party-defendant in the above entitled cause and may interpose any defenses and claims which it might have interposed had it been an original party-defendant to this suit.

2. That the time for filing Answer or other pleading on behalf of The Goodyear Tire & Rubber Company, Inc., and General Dry Batteries, Inc. may be extended to and including Feb. 28, 1942.

3. That the Defendants General Dry Batteries, Inc. and The Goodyear Tire & Rubber Company, Inc. and each of them admits the jurisdiction of this Court and waives service and accepts service of a copy of the Complaint.

4. That the Defendants need file only one Answer which may be on behalf of the Defendants jointly.

And that the Court may enter an order accordingly, notice by the Clerk being hereby waived.

January 29, 1942.

(Signed) Chritton, Wiles, Davies & Hirschl,
(Signed) Bernard A. Schroeder,
*Counsel for Plaintiff.*

(Signed) Bernard A. Schroeder,
*Solicitor for Plaintiff.*

(Signed) William E. Chilton,
*Counsel for Defendants.*
William E. Chilton,
1022 Leader Building,
Cleveland, Ohio.

January 28, 1942.
Lawrence T. Allen,
Ray M. Foreman,
Everett L. Dalbey;
*Solicitor for Defendants.*

It Is So Ordered 2/4/42
(Signed) Walter C. Lindley,
*U. S. District Judge.*

6 And on the same day, to-wit: the 4th day of February, A. D. 1942, the following further proceedings were had in said Court in said cause, and entered of record, as follows: Entered Feb. 4, 1942.

7 IN THE DISTRICT COURT OF THE UNITED STATES.

* * (Caption—240-D) * *

Wednesday, February 4th, A. D. 1942.

Present: Honorable Walter C. Lindley, Judge.

Now on this 4th day of February, A. D. 1942, upon consideration of the Stipulation by and between the parties hereto, duly filed and presented to the Court, and the Court being fully advised in the premises,

It Is Hereby Ordered By The Court, that the time for defendants to file Answer in this cause, be and the same is hereby extended to and including February 28th, 1942.

8 And afterwards, on to-wit: the 27th day of February, A. D. 1942, there was filed in the office of the Clerk of said Court in said cause, Joint Answer on behalf of Plaintiff The Goodyear Tire & Rubber Company, Inc., and Defendant Intervenor General Dry Batteries, Inc., which said Joint Answer was and now is in words and figures following, to-wit:

Filed Feb. 27, 1942. 9 IN THE UNITED STATES DISTRICT COURT

Eastern District of Illinois.

Ray-O-Vac Company,
*Plaintiff,*
*vs.*
The Goodyear Tire & Rubber Company, Inc.,
*Defendant,*
and
Generally Dry Batteries, Inc.,
*Defendant-Intervenor.*

JOINT ANSWER ON BEHALF OF THE GOODYEAR TIRE & RUBBER COMPANY, INC., DEFENDANT AND GENERAL DRY BATTERIES, INC., DEFENDANT-INTERVENOR.

(Filed Feb. 27, 1942. D. H. Reed, Clerk.)

This is a joint Answer filed on behalf of Defendant, The Goodyear Tire & Rubber Company, Inc., and General Dry Batteries, Inc., Defendant-Intervenor, an Ohio corporation, having a regular and established place of business at Cleveland, Ohio, pursuant to a Stipulation and Order entered herein on January 29, 1942.

The Defendants answering the Complaint of the Plaintiff, Ray-O-Vac Company, say:

First Defense.

In answer to Paragraph 1 of the Complaint, Defendants are not informed as to the corporate existence of the Plaintiff, and therefore deny the same and leave Plaintiff to its proof; but admit the remaining allegations of Paragraph 1.

10 Second Defense.

Answering Paragraph 2, Defendants admit that this is a suit between citizens of different States and also a suit arising under the Patent Laws of the United States for infringement of Letters Patent but Defendants are not

informed as to the amount involved in the controversy and therefore leave the Plaintiff to its proof.

Third Defense.

Answering Paragraph 3 of the Complaint, Defendants admit that United States Letters Patent No. 2,198,423 were issued to Plaintiff; but defendants are not informed as to whether Plaintiff has been and still is the owner of said Letters Patent and leave Plaintiff to its proof.

Fourth Defense.

Answering Paragraph 4 of the Complaint, Defendants deny each and every allegation of said Paragraph and leave Plaintiff to its proof. Defendant Goodyear Tire & Rubber Company, Inc., specifically denies that it has infringed or is infringing the patent in suit.

Fifth Defense.

Answering Paragraph 5 of the Complaint, each of said Defendants admits that it has received written notice of the alleged infringement of the patent in suit; but denies that it has infringed or continues to infringe said Letters Patent and denies all other allegations of said Paragraph.

Sixth Defense.

Further answering the Complaint, Defendants aver that said Letters Patent of the United States No. 2,198,423
11 are invalid and void for the reason that the alleged invention thereof attempted to be patented there, and each material and substantial part thereof, had, long prior to the alleged invention or discovery thereof by the said Herman R. C. Anthony, or more than two years prior to the filing of application for the said Letters Patent of the United States, been patented, described or contained in various patents and printed publications including the following:

United States Patents.

| No. | Date | Inventor |
|---|---|---|
| 267,577 | Nov. 14, 1832 | O'Harra |
| 286,809 | Oct. 16, 1883 | Haid |
| 393,577 | Nov. 27, 1888 | Paget |
| 503,415 | Aug. 15, 1893 | Gabarro |
| 570,591 | Nov. 3, 1896 | Ams |
| 627,917 | June 27, 1899 | Fuld |
| 690,770 | Jan. 7, 1902 | Reed et al. |
| 720,592 | Feb. 17, 1903 | Kohn |
| 902,681 | Nov. 3, 1908 | Perry |
| 933,525 | Sept. 7, 1909 | Brodie |
| 946,009 | Jan. 11, 1910 | Byrne |
| 1,120,354 | Dec. 8, 1914 | Young |
| 1,150,023 | Aug. 17, 1915 | Ford |
| 1,188,408 | June 27, 1916 | Burgess |
| 1,203,279 | Oct. 31, 1916 | Tarver |
| 1,233,204 | July 10, 1917 | Dunn |
| 1,279,280 | Sept. 17, 1918 | Csanyi |
| 1,299,813 | Apr. 8, 1919 | Armelin |
| 1,366,095 | Jan. 18, 1921 | Parker |
| 1,401,676 | Dec. 27, 1921 | Csanyi |
| 1,468,574 | Sept. 18, 1923 | Parker |
| 1,470,915 | Oct. 16, 1923 | De Olaneta |
| 1,611,153 | Dec. 21, 1926 | Benner et al. |
| 1,613,585 | Jan. 4, 1927 | Dam |
| 1,613,586 | Jan. 4, 1927 | Dam |
| 1,623,719 | Apr. 5, 1927 | De Olaneta |
| 1,654,823 | Jan. 3, 1928 | Millar |
| 1,657,543 | Jan. 31, 1928 | Lynn |
| 1,836,903 | Dec. 15, 1931 | Chaney |
| 1,914,057 | June 13, 1933 | Watzke et al. |
| 1,914,314 | Aug. 29, 1933 | Heise |
| 1,972,775 | Sept. 4, 1934 | Heise |
| 1,990,463 | Feb. 5, 1935 | Reinhardt |
| 1,991,132 | Feb. 12, 1935 | Anthony |
| 2,000,510 | May 7, 1935 | Corigliano |
| 2,014,856 | Sept. 17, 1935 | Martus et al. |
| 2,026,615 | Jan. 7, 1936 | Corigliano et al. |
| 2,060,832 | Nov. 17, 1936 | Smith |
| 2,062,107 | Nov. 24, 1936 | Reinhardt et al. |
| 2,081,926 | June 1, 1937 | Gyuris |
| 2,103,714 | Dec. 28, 1937 | Drummond |
| 2,143,245 | Jan. 10, 1939 | Lines |
| 2,158,151 | May 16, 1939 | Reinhardt |

Foreign Patents.

| | No. | Date | Inventor |
|---|---|---|---|
| British | 428,663 | Nov. 18, 1935 | Blomfield et al. |
| Australian | 27,412 | June 23, 1930 | Smith |

Seventh Defense.

Further answering the Complaint, Defendants aver that the said Herman R. C. Anthony was not the original, first and sole inventor of the alleged invention purported to be covered by said Letters Patent of the United States No. 2,198,428, or of any material or substantial part thereof; that the same was disclosed, prior to the alleged invention thereof by the said Herman R. C. Anthony, in the specifications and drawings of the Letters Patent recited in the Sixth Defense hereof, as well as in other patents and publications at present unknown to Defendants, but which, when known, Defendants pray leave to insert in this Answer by amendment.

Eighth Defense.

Defendants aver that long before any alleged invention by said Herman R. C. Anthony of the said alleged invention described or claimed in the Letters Patent in suit, the same was known to and used by the parties named below in this paragraph and at the places indicated; and that more than two years prior to the filing date of the application which resulted in said purported Letters Patent, the alleged invention thereof had been put into public use and on sale in this country by the following named parties at the places indicated below:

General Dry Batteries, Inc., and
Cyril P. Deibel, at Cleveland, Ohio;
Ray-O-Vac Company, at Madison, Wisconsin,

and by many other persons, parties, and at many other places which these Defendants have not yet ascertained but pray leave to insert in this Answer by amendment
13 as soon as discovered.

Ninth Defense.

Defendants, further answering on information and belief, aver that said Letters Patent are invalid and void because in view of the state of the prior art, as known at the time of and long prior to the alleged invention or discovery, the alleged invention purported to be patented did not constitute patentable invention but involved nothing more than the exercise of mere mechanical skill.

Tenth Defense.

Defendants, further answering, aver that the Letters Patent in suit are void as the claims thereof are for a non-patentable aggregation as distinguished from a patentable combination.

Eleventh Defense.

Defendants, further answering on information and belief, aver that the claims of said Letters Patent in suit are ambiguous and are not distinct and do not particularly point out the part, improvement or combination which the patentee claims as his invention or discovery.

Twelfth Defense.

Defendants, further answering, aver that said Letters Patent in suit are null and void for the reason that the alleged invention purported to be patented therein is not the same, and was not disclosed in the application therefor, as originally filed, but was added to said application by amendments to the specification and claims during the prosecution thereof and that said amendments were unaccompanied by any oath, or supplemental oath, of the said Herman R. C. Anthony, as required by the law and statutes of the United States in such cases made and provided.

14 Thirteenth Defense.

Defendants, further answering on information and belief, aver that by reason of the proceedings had or taken in the United States Patent Office in the prosecution of the

application for United States Letters Patent No. 2,198,423, the patentee thereof, his legal representatives, or assigns, are estopped from maintaining the same in such scope as to cover or to embrace any device which Defendants may have made, used or sold or which they are now making, using or selling.

Fourteenth Defense.

Defendants, further answering, deny that they have done, any act or thing or are doing any act or thing or proposing any act or thing in violation of the rights belonging to the Plaintiff or secured to it by said Letters Patent, and deny that the Plaintiff is entitled to an injunction or to any other relief; and Defendants further deny all allegations of the Complaint not herein specifically admitted.

Defendants charge and allege that the Complaint fails to state a cause of action cognizable in equity and deny that Plaintiff is entitled to any relief prayed for or to any relief whatsoever in this cause; deny Plaintiff's right to an injunction, damages, profits, costs, or accounting; and Defendants pray that the Complaint may be dismissed for want of equity with cost of Defendants.

15. COUNTERCLAIM.

Defendant, The Goodyear Tire & Rubber Company, Inc., and Defendant-Intervenor, General Dry Batteries, Inc., as a Counterclaim against Plaintiff, Ray-O-Vac Company, show to the Court and allege:

1. That Defendant, The Goodyear Tire & Rubber Company, Inc., is a corporation organized and existing under the laws of the State of Delaware and has a place of business at Indiana Avenue and Oak Street, Kankakee, Kankakee County, Illinois, and that Defendant-Intervenor, General Dry Batteries, Inc., is a corporation organized and existing under the laws of the State of Ohio and has its principal place of business at Cleveland, Ohio.

2. That, upon information and belief, the Plaintiff, Ray-O-Vac Company, is a corporation organized and existing under the laws of the State of Wisconsin and that it has its principal place of business at Madison, Dane County, Wisconsin.

3. That this Court has jurisdiction of the cause of action herein for a declaratory judgment or decree, under the Judicial Code Sec. 274-D, U. S. C., Title 28, § 400, arising from an actual controversy between the Plaintiff and the Defendants as to the alleged infringement by Defendants of United States Letters Patent No. 2,198,423 issued to Herman R. C. Anthony and by him assigned to Ray-O-Vac Company, the Plaintiff herein.

4. That said Letters Patent No. 2,198,423 are wholly invalid for the reason that the said Herman R. C. Anthony was not the first, original and sole inventor and discoverer of the matter patented therein, for the reasons, among others, set forth and alleged in the Fourth Defense to the Fourteenth Defense, inclusive, of this Answer, and now realleged with the same force and effect as if the same were here set forth in this Counterclaim.

Wherefore Defendants pray:

I. That the Complaint be dismissed upon the merits with costs to Defendants.

II. That this Court shall make a declaration having the force and effect of a final Decree in accordance with the provisions of Section 274-D of the Judicial Code, that by reason of non-infringement or invalidity of the claims of said Letters Patent No. 2,198,423 or hereinbefore set forth, the Defendants have the right to manufacture, use and sell the dry cells charged to be an infringement by the Complaint, without any liability of any kind or description to Plaintiff on account of infringement or threatened infringement of said Letters Patent No. 2,198,423.

III. That the Defendants may have such other and further relief in the premises as may be just.

The Goodyear Tire & Rubber Company, Inc.
General Dry Batteries, Inc.
Lawrence T. Allen
Everett L. Dalbey
By Ray M. Foreman
*Solicitor for Defendants.*

William E. Chilton
Fay Macklin Golrick Williams Chilton & Isler
William E. Chilton
1022 Leader Building, Cleveland, Ohio
*Of Counsel.*
Feb. 24th, 1942.

17 Service of a copy of the foregoing Joint Answer on behalf of The Goodyear Tire & Rubber Company, Inc., Defendant, and General Dry Batteries, Inc., Defendant-Intervenor, and Counterclaim acknowledged this 27th day of February, 1942.

Lindley, Jones, Grant & Sebat.
*Attorneys for Plaintiff.*

No Endorsements.

18 And afterwards, on to-wit: the 18th day of March, A. D. 1942, there was filed in the office of the Clerk of said Court in said cause, an Answer of Plaintiff to the Counter-Claim, which said answer was and now is in words and figures following, to-wit: Filed Mar. 18, 1942.

19 IN THE UNITED STATES DISTRICT COURT.

* * (Caption—240-D) * *

## ANSWER OF PLAINTIFF, RAY-O-VAC COMPANY, TO COUNTERCLAIM.

(Filed Mar. 18, 1942. - D. H. Reed, Clerk.)

Plaintiff, answering the counterclaim of defendant and defendant-intervenor, says that:

1. Plaintiff admits the allegations of Paragraph 1 of the counterclaim.

2. Plaintiff admits that it is a corporation organized and existing under the laws of the State of Wisconsin and that it has its principal place of business at Madison, Dane County, Wisconsin.

3. Plaintiff admits that this Court has jurisdiction of the controversy between the plaintiff and defendants.

4. Plaintiff denies that Letters Patent No. 2,198,42[illegible] are invalid and denies each and every allegation of Paragraph 4 of the counterclaim.

Plaintiff therefore denies that defendants are entitled to the relief prayed for in the counterclaim or to any part

thereof, or to any relief against this plaintiff, and it prays that the counterclaim be dismissed with costs to it.

Ray-O-Vac Company,
By (Signed) Chritton, Wiles, Davies & Hirschl,
*Its Attorneys.*

(Signed) Bernard A. Schroeder,
*Of Counsel for Plaintiff*,
2800 Board of Trade Building,
Chicago, Illinois.
(Signed) Lindley, Jones, Grant & Sebat,
*Attorneys for Plaintiff*,
305 Adams Building,
Danville, Illinois.

20 Service of a copy of the above answer by plaintiff is acknowledged this 18th day of March, 1942.

(Signed) Allen, Dalbey & Foreman,
*Attorneys for Defendants.*

Endorsed: In the United States District Court * * (Caption—240-D) * * Answer of Plaintiff, Ray-O-Vac Company to Counterclaim. Filed Mar. 18, 1942. D. H. Reed, Clerk. Chritton, Wiles, Davies & Hirschl, Attorneys at Law, 28th Floor, Board of Trade Building, 141 W. Jackson Boulevard, Chicago, Ill.

22 In the District Court of the United States.
* * (Caption—240-D) * *

## REPORT OF PROCEEDINGS AT THE TRIAL.

(Filed Jul. 6, 1942. D. H. Reed, Clerk.)

23 In the District Court of the United States.
* * (Caption—240-D) * *

Be It Remembered, That this cause came on for hearing on the 2nd day of June, A. D. 1942, in the District Court of the United States, in and for the Eastern District of Illinois, with the Honorable Walter C. Lindley, Judge, presiding, without Jury.

That, upon the hearing in said cause, Plaintiff was represented by Chritton, Wiles, Davies and Hirschl, by

Bernard A. Schroeder, Esquire, Russell Wiles, Esquire, and Harold F. Lindley, Esquire:

That Defendant and Defendant-Intervenor were represented by Fay, Macklin, Golrick, Williams, Chilton & Isler, by Wm. E. Chilton, Esquire, and Chas. W. Williams, Esquire, and E. L. Dalbey, Esquire:

24 And thereupon, upon said hearing, the following proceedings were had:

Opening statements to Court by Bernard A. Schroeder, Attorney for Plaintiff:

Opening statement to Court by Wm. E. Chilton, Attorney for Defendant, and Defendant-Intervenor.

And the Plaintiff, to sustain the issues in its behalf, introduced the following evidence, that is to say:

Mr. Schroeder: If the Court please, on April 16th, we took the depositions in Chicago of five witnesses and I would like to start by reading the depositions into the record. They are rather short and I will omit the formal matters.

(Mr. Schroeder reading:)

Q. Please state your full name.
A. Meyer Friedman.
Q. You are here in answer to a subpoena by Plaintiff?
A. Meaning Ray-O-Vac Company?
A. Yes.
A. Yes, I am.
Q. You are of adult age?
A. I think so.
Q. What is your occupation, Mr. Friedman?
A. I am part owner of the Triangle Supply Company, 1923 South Michigan.

Mr. Chilton: Defendants have no objection to the waiving of the reading of the depositions at this time unless
25 the Court wants to hear them. We have some and it will take some time to read them all into the record.

The Court: You may summarize them.

Mr. Schroeder: Meyer Friedman is a part owner of a little store in automobile row in Chicago. He sells automobile supplies, flashlights, flashlight batteries and has been in this business for twenty years; that, he testified he was very familiar with the problem of swellage and leakage; that they had a little trouble with the first Leakproof cells brought out, and after that, it was all right.

He described the construction of it, although, he stated, he had not studied the model carefully. He knew of it as a commercial product. On cross-examination, it was brought out there was no vent hole in the commercial Leak-proof cell, and he said he thought he had seen these cells during the past four years, but he wasn't quite sure when they came out.

The next witness was Leonard D. Karcher. Mr. Karcher is a Chicago Attorney, formerly an officer of the State of Illinois, having been Security Commissioner of the State. He said he had had experience with flashlights over a great many years. He testified that he was out in Colorado in 1935 and the lights of his car went out and he reached in his car to get his flashlight to warn other cars coming toward him, or coming from behind, but the flashlight did not work, and he had a great deal of difficulty getting into town. In the morning, he went in to get some new
26 cells and he could not get the old cells out of his flash-light; as a result, he had to buy a new one. He further said that he carried a small flashlight in his vest when going to the opera in order to read the program, and the flashlight would not be used for three or four months at a time. When he came to use the light in the Fall, the cell was dead and the cell was swollen up and he could not get it out. He bought one flashlight recently, which we want to offer in evidence. He lives near Barrington, in the country, and he decided he needed a flashlight so he wrote to Montgomery-Wards and they sent him this flash-light and with it came a little slip of paper, warning him as follows: "Do not leave flashlight batteries in flash-lights after they are dead or after they begin to show signs of oozing." A warning to take the cells out quickly to save the casing. We offer this in evidence as PLAINTIFF'S EXHIBIT NO. 1.

The Court: It may be received in evidence.

Mr. Schroeder: Attached to the cell was a ticket of the Blake Manufacturing Company, and on the back of this is a warning that "We will not replace or repair free of charge flashlights which have become inoperative because of oozing battery electrolyte". A warning, again, to take the old cells out. We offer that in evidence as PLAINTIFF'S EXHIBIT NO. 2.

The Court: It may be received in evidence.

Which said Plaintiff's Exhibit No. 2, is in words and figures following, to-wit:

27 Mr. Schroeder: We offer the flashlight, itself, which he received. I think this was in March of this year, and we offer this as PLAINTIFF'S EXHIBIT NO. 3, and in that flashlight are two ordinary dry cells. Can you state whether they are General Dry Cells?

Mr. Chilton: Yes, sir. That is not the disputed construction?

Mr. Schroeder: No. There is a notation on this cell—"Remove cell from case when exhausted".

The Court: The exhibits may be received in evidence.

Mr. Schroeder: The Karcher testified that a few days later, he forgot that he had purchased a flashlight and he needed one, so he wrote to Sears-Roebuck and ordered a three cell flashlight. This was received a few days later and this flashlight had three cells of the Leak Proof type and it will be shown that these were made by the Ray-O-Vac Company, and they have a guarantee. I would like to offer this flashlight as PLAINTIFF'S EXHIBIT NO. 4.

The Court: Plaintiff's Exhibit No. 4 may be received in evidence.

Mr. Schroeder: He testified that he did not order these at the suggestion of Plaintiff's Counsel, but for his own use, and, at the request of opposing Counsel, he brought the flashlight in a few days later.

The next witness was D. C. Curtis, Chief Purchasing Officer of the Chicago, Milwaukee, St. Paul and Pacific Railroad, and he testified that the St. Paul Railroad

28 had been using flashlights for four or five years. His department buys about seventy thousand items but he was familiar with the merits of the Leak Proof cell. He said his Company used them and there had been no complaints that had come to his attention; he said they would if there had been any complaints. He testified he had had experiences with cell swelling. He has a country place in Wisconsin, and he keeps flashlights up there and when he went to use them, he had to get a hammer to drive the old cells out and then he got some Ray-O-Vac Leak Proof cells and, of course, has had no trouble with them.

The next witness was William R. Steinmayr, who is with the Pullman Company. In August of 1939, there was a bad wreck in Colorado and one of the Pullman Conductors

happened to have a flashlight. As a result, he was able to get a number of people out of the overturned cars and the saving of life was considered by the Pullman Company so important that they decided to equip all cars with them and they sent out to different companies for samples. That was just about the time this Leakproof cell was being introduced. They seemed to think that was just what they wanted and they purchased about eleven thousand of these flashlight cases; there is a flashlight in each car and they have about six thousand in service. They are subjected to all uses; they are left out in the track at sub-zero temperatures and they stand out in the yards when the temperature is away up, and the high temperature is much harder on the cell than the cold, but he said these cells are locked in a glass compartment in the car and they are
29 inspected regularly; that they take an awful beating. He said that all equipment is subject to a lot of vibration which they consider hard usage. These cells have been used by them continuously since 1939 and they have never had a single case of leakage. After six months service, they inspect the cells and sometimes replace some of them, the ones removed then being given to the shop employees, and he said, in his opinion, they were as good as new cells. That is another type of use where a cell is subjected to a very severe shelf life test and then put into active duty.

The next witness was Mr. Bogumill, Assistant Superintendent of the South District Shop of the Distribution Department of the Peoples Gas, Light and Coke Company. All of these witnesses were present in answer to subpoenas. Mr. Bogumill had been in the Department for eighteen years, and testified that they used a large number of flashlights for meter readers. I asked him "Do you know approximately how many of these Leak Proof cells your company has used in the last three years?" and he said, "I would venture to say that it is between eighty thousand and a hundred thousand cells a year. That is about an average figure. I know that our own particular division uses about thirty-five thousand a year". He said he knew about the guarantee but never had any occasion to avail themselves of it for the Leak Proof cell had been very satisfactory. They are perfectly satisfactory and they are perfectly satisfied with it.

I think that is a summary of the contents of the
30 depositions.

The Court: Each of the depositions will be incorporated in the record.

Which said depositions are in words and figures following, to-wit:

31 IN THE DISTRICT COURT OF THE UNITED STATES.

* * (Caption—240-D) * *

The depositions of Meyer Friedman, Leonard D. Karcher, D. C. Curtis, William R. Steinmayr, and William Richard Bogumill taken on behalf of plaintiff, in the above entitled case before George J. Drobnis, a Notary Public of Cook County, Illinois, on the 16th day of April, A. D. 1942, at Room 2800, 141 West Jackson Boulevard, Chicago, Illinois, pursuant to notice hereto annexed.

Present:

Messrs. Chritton, Wiles, Davies & Hirschl, by Mr. Bernard A. Schroeder, for Plaintiff;

Messrs. Fay, Macklin, Golrick, Williams, Chilton & Isler, by Mr. William E. Chilton, for Defendants.

32 Mr. Schroeder: These depositions are taken on April 16, 1942, de bene esse, on behalf of the Ray-O-Vac Company, plaintiff, pursuant to notice.

MEYER FRIEDMAN, being duly sworn, doth depose and say in answer to interrogatories proposed to him by Mr. Bernard A. Schroeder, counsel for plaintiff, as follows, to-wit:

Q. 1. Please state your full name.
A. Meyer Friedman.
Q. 2. Are you here in answer to a subpoena by plaintiff?
A. Meaning Ray-O-Vac Company?
Q. 3. Yes.
A. Yes, I am.
Q. 4. You are of adult age?
A. I think so.
Q. 5. What is your occupation, Mr. Friedman?
A. I am a part owner of the Triangle Supply Company, 1923 South Michigan.

Q. 6. Chicago?

A. Chicago, yes, sir.

Q. 7. In what sort of goods does your company deal?

A. We are jobbers of hardware and mill supplies catering to factories. Carry a varied line of material.

33 Q. 8. Do you deal in flashlights or flashlight batteries?

A. Yes. We carry Ray-O-Vac flashlight batteries and Ever-Ready flashlight batteries, and also carry flashlights.

Q. 9. Cases?

A. Cases, yes.

Q. 10. Is the majority of your business retail or with wholesale distributors?

A. Well, we sell to factories which are considered wholesale. They consume the merchandise themselves; and they also buy merchandise for resale purposes. That is, it goes into the manufacture of certain items, and that is considered retail, but we sell maintenance supplies.

We are classified as wholesalers.

Q. 11. What sort of users of flashlights do you deal with; what different kinds of concerns?

A. Well, we sell flashlights to practically everybody, and, as far as the users are concerned, they are more or less watchmen. That is, we sell them to the large plants that buy them in carton lots or more, and they give them to their watchmen, and they use them at all times, specially during the night.

Q. 12. Do you also sell to service stations?

34 A. Yes. We sell automobile dealers and service stations. Trucking companies.

Q. 13. How many years have you had experience with flashlights?

A. About 18 years.

Q. 14. Are you familiar with the problems or difficulties concerning flashlights?

A. I think I am.

Q. 15. What difficulties have you encountered in your experience with flashlights?

A. Well, every once in a while in selling flashlight cases the case will not work and it is usually due to a short in the switch, or something is wrong with the battery. I am speaking about new cases and new batteries at the present time.

Q. 16. Is that before or after use?

A. Before use. After they have been sold, once in a

while we will have customers that will come in just for batteries only, and they will bring new cases; sometimes they are O. K. and sometimes they are not.

Q. 17. Well, can you describe the condition of the cases which you say are not O. K.?

A. Many times they will bring in a new case or a case that has been in use for about six months or so with
35 corroded batteries, that is, batteries that are hard to get out of the case. It seems as if there is some water or something that comes out of the battery and it corrodes right into the flashlight case, and it is hard to remove those. Sometimes they have to use a hammer to get them out.

Q. 18. And you have had this difficulty yourself in attempting to remove cells from cases?

A. Yes, I have, in the past 18 years.

Q. 19. What has been the effect on the flashlight case in removing such cells?

A. In most cases after you remove a battery like that and you have to use a screwdriver or a hammer to get it out, the case is no good. You would have to buy a new case as well as new batteries.

Q. 20. You have stated that you also handle the plaintiff's Ray-O-Vac batteries. Have you had any experience with the Leak Proof Unit Cell?

A. Yes, I have. In the past four years that I could accurately remember I do not recall at any time having any trouble with the leak proof cells as to corrosion in a flashlight or in a case.

Q. 21. Will you describe briefly the difference between the Ray-O-Vac Leak Proof Cell and the other cells
36 that you handled in the past 18 years?

A. Yes. The leak proof cell has a metal cap, and also metal all around the flashlight battery, whereas the other flashlight batteries,—well, it has not got a metal cell at all. It is just a plain ordinary battery, a common everyday battery.

Q. 22. You mean by "metal", it does not have a metal outer jacket?

A. Well, the metal is on the top of the battery and around the outer part of the battery, and also on the bottom—well, no, it does not cover the bottom of the battery.

Q. 23. Have you ever had any difficulty with swelling or leakage in Ray-O-Vac Leak Proof Cells?

A. Not; as I say, in the last four years I can thoroughly

remember, not in the last four years. We may have had some trouble with it when it first came out, which I do not seem to remember that far back. But in the last four years, that is when we went in business for ourselves, we used their cells, and I don't remember any leakage or corrosion at all.

Q. 24. Are you familiar with the warranty or guaranty that the Ray-O-Vac Company makes regarding these
37 cells?

A. Well, I am not exactly familiar with it because I have never had to make a replacement on a Ray-O-Vac battery, but if anything should come up where they had trouble such as that, I would be glad to replace the battery and also the flashlight case if it spoiled the case, and then take it up with the Ray-O-Vac Company.

Q. 25. But you said that you have never had to make such a replacement where the Leak Proof Cells were used.

A. Never had to make a replacement.

Mr. Schroeder: The direct examination closed.

You may cross-examine.

And in answer to cross-interrogatories proposed to him by Mr. William E. Chilton, attorney for Defendants, he saith:

XQ. 26. When did the Ray-O-Vac Leak Proof Cell first come out, do you know, approximately?

XA. I would say about six or seven years ago, if I can remember correctly.

XQ. 27. Now, you have spoken of having had some trouble in the beginning. What was the nature of that trouble? I am referring now to the Ray-O-Vac Leak Proof.

XA. Well, the most trouble we ever had with Ray-O-Vac batteries at the beginning when they came out with
38 the Leak Proof Cell was the fact that it did not stand up as well as the regular.

XQ. 28. You mean from a standpoint of current, life?

XA. Life, that is right.

XQ. 29. What about the leak proof characteristics of it?

XA. I do not recall.

XQ. 30. You do not recall that?

XA. I do not recall as far back as six or seven years ago. In the past four years I do not recall having any trouble at all.

XQ. 31. Was the Ray-O-Vac Leak Proof Cell that you speak of completely closed within a metal case?

XA. It was completely closed,—I do not think the bottom of it, that is the last part that goes into the flashlight case.

XQ. 32. It is the metal cap that is sealed to the outer case, is it not?

XA. It is a complete outer casing. In other words, it is the part that makes contact. It is a little brass cap on the top from there on all the way to the bottom, if I can remember correctly, is enclosed in metal.

XQ. 33. Was there a vent opening in that brass cap?

39 XA. By a vent opening do you mean where the little brass cap comes out?

XQ. 34. That is over the carbon pencil. You understand the cell process, the carbon pencil, and the mixing can, and the pencil sticks up a little way.

XA. The way I understand the battery, you have a regular flashlight battery and on the top is a little brass part that comes like that. (Illustrating.) Now, when you say "the vent" you mean the little opening where this comes out, where the little brass cap comes out?

XQ. 35. No, an opening in the brass caps. Is there an opening in the brass cap?

XA. An opening in the top of the brass cap?

XQ. 36. Yes.

XA. Here is your brass cap. (Illustrating.) You want to know if there is an opening in there?

XQ. 37. Yes.

Mr. Schroeder: Let the record show that the witness is demonstrating with a pencil and does not have a cell in his hand.

Mr. Chilton: Maybe you will get this straight if I will show you this.

I show you Anthony Patent 2198423. What I am referring to is this cap indicated as 21, reference character 21, in Fig. 1.

40 XQ. 38. I am asking you if the Ray-O-Vac cells which you handled had the vent opening at that point there, if you recall?

XA. I do not seem to remember that.

XQ. 39. You do not remember that?

XA. No.

XQ. 40. And in the last four years, you testified, you have not had to replace any flashlight cases?

XA. I have never had to replace any Ray-O-Vac batteries as to corrosion or leakage. I have had to replace

them because of the fact that the customer claimed that the battery did not stand up, but we made a replacement.

XQ. 41. Were you ever employed by Ray-O-Vac?

XA. No, sir.

XQ. 42. No connection with the Ray-O-Vac Company?

XA. No, sir. I had three jobs in my life.

XQ. 43. You are here by reason of the subpoena?

XA. That is right.

XQ. 44. Did you insist you be served a subpoena to attend this hearing?

XA. No, sir. I told them that I would be up here.

XQ. 45. Does that Ray-O-Vac Leak Proof Cell have a single or double bottom wall?

XA. I could not tell you that.

41 XQ. 46. You do not know that?

XA. When you say "single or double bottom wall," you mean the inner?

XQ. 47. I mean the bottom of the battery, the bottom of the dry cell; is it in two walls or two thicknesses, or one?

XA. I could not answer that question. I have never taken a Ray-O-Vac battery apart.

XQ. 48. You never took one apart?

XA. No, sir.

Mr. Chilton: That is all.

And in answer to redirect interrogatories proposed to him by Mr. Bernard A. Schroeder, attorney for Plaintiff, he saith:

RDQ. 49. Are you perfectly sure in your own mind as to the first date that the Leak Proof Cell was introduced?

RDA. Pardon me, I did not hear that. What was that?

(The last interrogatory was read.)

RDA. No, sir.

Mr. Schroeder: That is all.

Mr. Chilton: That is all I have.

And further Deponent saith not.

42 LEONARD D. KARCHER, being duly sworn, doth depose and say in answer to interrogatories proposed to him by Bernard A. Schroeder, counsel for plaintiff, as follows, to-wit:

Q. 1. Please state your full name and residence.

A. Leonard D. Karcher, Barrington, Illinois.

Q. 2. Are you here in answer to a subpoena by the plaintiff, Ray-O-Vac Company?

A. I am.

Q. 3. What is your occupation, Mr. Karcher?

A. I am a lawyer.

Q. 4. Do you specialize in any particular type of law?

A. In security law and corporation law, primarily.

Q. 5. Have you ever been an officer of the State of Illinois?

A. Yes. I was Security Commissioner of the State of Illinois for two or three years, from 1932 to '35, I believe it was. Also had a great deal of dealings with the S. E. C.

Q. 6. Have you had any experience with flashlights and flashlight batteries?

A. Yes, I have.

Q. 7. Over how long a period would your experience extend, that you recall?

A. Well, I should say it extends for probably 15, 20 years.

43 Q. 8. What use do you make of flashlights, if any?

A. Well, I always carry a flashlight in the car and I also have them around the house. Living in the country it is necessary to go out, and we have flashlights out there. Sometimes the electricity goes off and we need an electric flashlight.

Q. 9. Have you ever had any difficulty with flashlight batteries?

A. Yes, I have.

Q. 10. Will you explain just what your experience has been in that respect?

A. Well, I have had it happen a number of times where the flashlight battery has corroded and has swelled, and corrosion of some sort comes out of the cell, it gets soft and sticks in the flashlight cell itself. Sometimes I have not been able to get it out, and sometimes when I have, I have ruined the case, and had to purchase a new flashlight case.

Q. 11. Can you tell us of any specific case where you had this difficulty?

A. I remember one case very vividly was about 1935 or '36, I was touring in the west, and outside of Walsenburg, Colorado, my headlights went out. It was dark. So I reached in the pocket of the car to get out the flash-

44 light so I could warn cars coming towards me, or those in back of me.

My flashlight did not work either. Luckily a man came

along and stayed back of me so I was silhouetted and I could see where I was driving.

Well, the next day at Walsenburg, naturally I wanted to get some new batteries for the flashlight, and I was going to buy the batteries if I could put them in, but I could not get the other batteries out. They were swollen, and it finally ended up by my throwing away the flashlight and buying a new one.

Then another case that I remember distinctly. I carried a small flashlight in my vest of my clothes when I go to the opera so I can read the program, and it might be several months between seasons, and it would remain in my pocket, and in one case I had to buy a new flashlight because I could not get the battery out of that small pocket flashlight due to swelling, or I do not know what it was—I do not know the technical terms, but it ruined the flashlight, and I could not get the battery out.

Q. 12. Have you bought any new flashlights recently?

45 A. Yes, I bought three. Well, one I bought from Sears Roebuck which was a 2-cell flashlight, and about the same time I bought a 3-cell flashlight from Montgomery Ward, both bought through mail order as we buy most of our things from those two concerns. And then one was about a month ago, I bought a small 3-inch case where you put in 2 pen-light batteries for my little daughter.

Q. 13. Referring now particularly to the flashlight that you purchased from Montgomery Ward, do you recall how the flashlight was packed and anything unusual about it?

A. Well, that was about two or three months ago, I purchased it, and it was delivered at the house, and the flashlight was in a cardboard container, and in the container was the flashlight and also a slip of paper, I think it had "Caution" written on it; and also a tag from the concern that made the flashlight, a card.

Q. 14. Do you recall the general text of the printed matter on the "Caution" slip?

A. Yes. It stated that flashlight batteries are liable to deteriorate or swell, and liable to ruin the flashlight.

Q. 15. I hand you a slip of paper and ask you if

46 you can tell us anything about this? Have you ever seen similar slip?

A. Yes, this is exactly the same kind of a slip that was enclosed in the package that I received from Montgomery Ward.

Q. 16. And I hand you a tag with a string on it and ask you if this recalls anything to your mind.

A. Yes. That is the same kind of a card that I mentioned previously which was enclosed in the package that I received from Montgomery Ward that contained the flashlight.

Mr. Schroeder: I would like to offer the first slip referred to by the witness as Plaintiff's Exhibit 1, and the small tag with the string attached to it as Plaintiff's Exhibit 2.

Mr. Chilton: I will have to object to these as being irrelevant and immaterial unless it is shown where they came from. I do not know also what it has to do with this case. The purpose of it is not clear to me at present.

Mr. Schroeder:

Q. 17. Will you state, Mr. Karcher, where the slips of paper, that you originally testified to came from?

A. They came with the flashlight that I purchased at Montgomery Ward's.

47 Q. 18. And was that sent to you directly by Montgomery Ward through the mail?

A. It was sent directly to my residence in Barrington through the mail from Montgomery Ward.

Mr. Chilton: Do you know who made the cell or the flashlight?

A. I do not, no.

Mr. Chilton: Was it a flashlight or cell you bought?

A. I bought the flashlight.

Mr. Chilton: And cell?

A. And the batteries that go with it.

Mr. Chilton: No name on it?

A. Yes, there was a name on the batteries. I do not remember what the name on the batteries was but the name on the flashlight was Pressed-In "Streamlight", or some name like that; it was a trade name. It was not the name of the manufacturer or it was not Montgomery Ward's name.

Mr. Schroeder: I would like to renew my offer of these slips of paper as Plaintiff's Exhibits 1 and 2.

Mr. Chilton: I have no objection but would suggest that counsel produce a sample of those batteries if it is

48 available and if you can.

Mr. Schroeder: I will be glad to do so, if I can.

(Which said documents, so offered, were thereupon marked PLAINTIFF'S EXHIBITS 1 and 2.)

Mr. Schroeder:

Q. 19. Do you think, Mr. Kareher, that you can produce a sample, or one of the cells from each of the flashlights that you purchased from Montgomery Ward and Sears Roebuck?

A. Yes, I will bring those in tomorrow. I have the flashlight with the three batteries in that I purchased at Montgomery Ward's, and also the flashlight in my car that I purchased from Sears Roebuck, and I will bring in the batteries tomorrow, or do you wish the entire flashlight with the cells complete?

Mr. Chilton: I would suggest the latter, the complete flashlight.

Mr. Schroeder: I will attempt to produce the two flashlights that were mentioned by Mr. Chilton, and will offer them as Plaintiff's Exhibits 3 and 4, the one from Montgomery Ward's being Plaintiff's Exhibit 3, and the one
49 from Sears Roebuck being Plaintiff's Exhibit 4.

A. I wish to state that the flashlights that I bring in will be the flashlights as received from Montgomery Ward and Sears Roebuck including the batteries that came with each flashlight. I do not have the slip of paper or the card, but I remember reading it at the time I received it from Montgomery Ward.

(Which said articles, so offered, were thereupon designated as PLAINTIFF'S EXHIBITS 3 and 4, respectively.)

Mr. Schroeder:

Q. 20. Referring now to the flashlight, Plaintiff's Exhibit 4, which you received from Sears Roebuck & Company, did this shipment contain any caution or tag, if you recall?

A. No, it did not.

Q. 21. Do you recall the type of cells that were with Plaintiff's Exhibit 4 when you received it?

A. Well, they were a gray colored cell and there was a guaranty, there is a guaranty printed on the outside of the cell itself. The Guaranty states that they will replace the flashlight if the case is ruined by the batteries. I be-
50 lieve that is the import of it. In fact, I am sure it is. I do not know who the manufacturer of those batteries is. I haven't the faintest idea who made them.

Q. 22. Do you recall whether the battery received from Sears Roebuck had a metal shell, or not?

A. I am certain it was not cardboard around them, or it was not paper around them, and I should say it was metal or some hard material like metal.

Q. 23. At the time that you made these purchases from Montgomery Ward and Sears Roebuck did you have any knowledge of the present litigation between Ray-O-Vac Company and the defendant, Goodyear Tire, and the defendant, General Dry Batteries?

A. No, I did not.

They were purchased without any knowledge that there was any litigation pending. They were for my own use entirely, never been out of my house except in the car.

Q. 24. Was the purchase made at the suggestion or request of Plaintiff or Plaintiff's counsel?

A. It was not.

Mr. Schroeder: Direct examination closed.

51 And in answer to cross-interrogatories proposed to him by William E. Chilton, counsel for defendants, he saith:

XQ. 25. You do not know, do you, who made either one of these cells or lights?

XA. I do not know, no.

XQ. 26. How long ago did you buy them?

XA. Within the last two or three months. I can look at my checkbook and see.

XQ. 27. Have you been using them during that period, since that time?

XA. Yes, they have been used. I used it last week, in fact, one of them.

XQ. 28. You spoke of a small 3-inch case that you bought recently.

XA. Yes.

XQ. 29. What was that

XA. That was a little vest-pocket flashlight that you carry in your pocket.

XQ. 30. Like this? (Exhibiting a flashlight.)

XA. No, no. It is about that long and about that wide. (Indicating.) It is about an inch and a half wide and about three inches long and thick enough so that one of the pen-light batteries, 2 pen-light batteries, will fit in

52 side by side. The top comes off, and it is made of plastic.

XQ. 31. On the occasion when your headlights went bad in the west, when was that, approximately?

XA. It was a few years ago. It might have been '35, 36; 1935, 1936.

XQ. 32. What sort of a flashlight did you have then, do you recall?

XA. I don't remember. It was probably, the usual black-case flashlight. I don't remember that exactly.

XQ. 33. And the cells were stuck in there?

XA. The cells were stuck in, yes.

XQ. 34. And you bought a new one at the next town?

XA. I bought one at Walsenburg, the next moring.

XQ. 35. What was the new one?

XA. I don't remember. Just a flashlight.

XQ. 36. Do you know who made this cell in this 3-inch case you speak of?

XA. I haven't the faintest idea.

Mr. Chilton: That is all.

Mr. Schroeder: That is all.

And Further Deponent Sayeth Not.

53 D. C. CURTIS, being duly sworn, doth depose and say in answer to interrogatories proposed to him by Mr. Bernard A. Schroeder, counsel for Plaintiff, as follows, to-wit:

Q. 1. Will you please state your full name, Mr. Curtis?

A. D. C. Curtis, Chief Purchasing Officer, Chicago, Milwaukee, St. Paul & Pacific Railroad.

Q. 2. Where is your office, Mr. Curtis?

A. 728 Union Depot, Chicago.

Q. 3. Are you here in answer to a subpoena by Ray-O-Vac Company, the plaintiff?

A. Yes, sir.

Q. 4. How long have you been the Chief Purchasing Officer of the Chicago, Milwaukee & St. Paul Railroad?

A. Since May 1, 1925.

Q. 5. And prior to that you were in a similar capacity?

A. General Storekeeper of the Milwaukee.

Q. 6. Can you state approximately how many different items are purchased or stored by your department for use on the railroad?

A. Approximately 70,000.

54 Q. 7. Have you had any experience with flashlights and flashlight batteries?

A. Personally or the company?

Both. I have had both.

Q. 8. Will you tell us about your experience with the company first, please?

A. Well, of course, the experience with the company is pretty general.

We buy flashlight cells and distribute them out on the railroad and keep them supplied. Price and quality are the determining factors in the purchases.

Q. 9. What is the principal use that is made on the railroad of flashlights?

A. Inspection work.

Q. 10. Is that around the shops?

A. Around the shops and around the repair tracks.

Q. 11. And they are also used by enginemen?

A. Yes, sir. Only recently by the enginemen.

Q. 12. About how long has the railroad been using flashlights in any quantity?

A. Oh, flashlights, comparatively a few years.

Q. 13. Would you say about 10 years?

A. No, not that long, in quantity, we have not been using flashlights. I should say the last three or four years.

Q. 14. Where were they first used in railroad work, that is on your railroad?

A. Oh, I should say inspection work by the shop electricians and shopmen.

Q. 15. How about in connection with oil storage and work of that kind?

A. Well, that is in your shop work, of course, your shopmen, your store-house.

Q. 16. To you knowledge, do you have any difficulties on the railroad with flashlight batteries?

A. Oh, you always have difficulty with any material that you use, particularly new material that is coming along.

Q. 17. Do you recall any particular difficulty with flashlight batteries?

A. Well, the trouble with flashlight batteries, of course, has been the sticking in the cases more than anything else; short life at times.

Q. 18. I believe that you stated that you started using flashlights in quantities three or four years ago.

Before starting to purchase these in quantity were any tests made?

A. No, not as such on our railroad. There were no test

run particularly, that is what we call a test. They are rather like Topsy, just grew.

56 Q. 19. Do you recall the particular kinds of batteries that were first adopted?

A. No, I do not.

Of course, we have offered to us practically all kinds of batteries continually. We buy a good many different kinds.

Q. 20. Do you use the Ray-O-Vac Leak Proof Cell?

A. Yes, sir.

Q. 21. What has been your experience with that particular cell?

A. Well, we like the Leak Proof Cell very much in preference to the others.

Q. 22. So far as you know, have there been any complaints of leakage or swellage of those cells?

A. Not that I know of.

Q. 23. You also mentioned that you had had personal experience with flashlights and difficulty with the batteries. Will you explaint that to us, please?

A. Why, I keep batteries, I keep flashlights up in my cabin in the woods. Sometimes I do not get up there for two or three months at a time, and maybe, in the winter, longer. Every once in a while I have found them swollen so I have had to take a stick and hammer to get them out of the case.

Q. 24. Have you ever made any personal use of the

57 leak proof cells?

A. Yes, sir.

Q. 25. Did you have any of that difficulty that you just referred to?

A. None of that difficulty with them.

Q. 26. Those cells have been satisfactory?

A. Yes, sir.

Mr. Schroeder: Direct examination closed.

*Cross-Examination.*

And in answer to cross-interrogatories proposed to him by Mr. William E. Chilton, counsel for Defendants, he saith:

XQ. 27. You say the railroad company began to use the dry cells and flashlights about three or four years ago?

XA. To the best of my recollection, yes. That is when they commenced to use them so we commenced to notice it.

Probably there were flashlights around on the railroad a long time before that. Until we commenced to purchase them in quantities so we commenced to notice them.

XQ. 28. What product were you using at that time?

XA. We used Burgess.

XQ. 29. You used Burgess. I mean when you began to use batteries, what batteries did you use, or what flashlights did you use?

58 XA. Oh, we used practically all the makes, practically all of them. They are all after us and we buy all of them if their prices are where we can buy them.

XQ. 30. Do you still handle other products, other flashlights than Ray-O-Vac?

XA. Oh, yes.

XQ. 31. What other products do you handle of that character?

XA. Oh, I don't know, there are three or four of them that we buy from.

XQ. 32. Do you know the names of the manufacturers?

XA. No, I do not know the names of them particularly. We buy practically all of them.

XQ. 33. Do you use any Burgess batteries?

XA. Yes, sir.

XQ. 34. Do you use any National Carbon?

XA. Yes, sir.

XQ. 35. Do you use any purchased from General Dry Batteries, Inc., or made by them?

XA. Yes. They are in Dubuque?

XQ. 36. Yes, they have a plant in Dubuque.

XA. Yes.

XQ. 37. How long have you used the Ray-O-Vac leak proof cells?

XA. Oh, I think since they have come out, probably as soon as they got to merchandise them.

59 XQ. 38. Three or four years ago?

XA. Yes, they offered them as soon as they came out. I do not remember the exact date when they did. They always bring those new products over as soon as they are ready to merchandise them.

XQ. 39. But you say you made no tests of any kind on any of these batteries?

XA. No, no. We have not made any tests.

XQ. 40. Have you had occasion to replace the cells in the Ray-O-Vac flashlight since you have been using them?

XA. Oh, we always have, yes. They wear out. We replace them right along.

XQ. 41. Have you had any instance where the cells did stick into the flashlight case?

XA. Not that I know of. That is of the Leak Proof you are talking about?

XQ. 42. Yes

XA. Not that I know of.

XQ. 43. Would you necessarily have known if that condition had existed?

XA. If it amounted to anything I would have because complaints move across my desk of things that are not satisfactory.

Mr. Chilton: That is all.

Mr. Schroeder: That is all.

And Further Deponent Saith Not.

60 WILLIAM R. STEINMAYR, being duly sworn, doth depose and say in answer to interrogatories proposed to him by Mr. Bernard A. Schroeder, counsel for Plaintiff, as follows, to-wit:

Q. 1. Please state your full name, Mr. Steinmayr.

A. William R. Steinmayr.

Q. 2. And what is your occupation, Mr. Steinmayr?

A. Buyer for the Pullman Company.

Q. 3. And where do you have your office?

A. 220 South State.

Q. 4. Are you here in answer to a subpoena by Ray-O-Vac Company?

A. That is correct.

Q. 5. How many years have you been with the Pullman Company?

A. 20 years.

Q. 6. And during that period have you had any experience with flashlights or flashlight batteries?

A. I would say I have had considerable experience with them.

Q. 7. Have you ever had any difficulty with batteries that were purchased by your company?

A. Yes, we have had difficulty with batteries in the past because we always use metal cases. It is the case of
61 the electrolyte oozing out of some of the batteries that we have purchased, swelling, and damaging the cases,

Q. 8. That is flashlight cases that you are referring to?

A. That is right.

Q. 9. What type of cells were those; what sort of covering did you have on the cells that oozed out?

A. The conventional type of covering. The zinc case and paper cardboard container in which the cell was placed.

Q. 10. Would you say that difficulty was fairly common or was it very unusual?

A. I would say it was quite common particularly in cases where the flashlights were laid aside for a time; in other words, not used regularly by our inspectors who use them every day. Where they are put on the shelf and allowed to remain for a while, subjected to differences in temperature and dampness, why, we did have those things happen to them.

Q. 11. What is the principal use that is made of flashlight batteries in your company?

A. Well, the principal use since 1929 has been on
62 our cars. We put a flashlight on each of our cars, and we have around 6,000 in service. They are placed on there for emergency purposes along with the fire extinguisher, in the same cabinet. That cabinet has a glass face to it, framework; about a dozen screws in it. When we reached the point where we decided to do that we felt that we better look around and see what kind of a cell we could get that would retain some usefulness over quite a long period of time, because our inspections would only be somewhere around every six months. We could not afford to have one of those cases go bad. In a bad wreck, why, it was there for a purpose, and we wanted it to work.

Q. 12. It was used as an emergency matter entirely?

A. That is right.

Q. 13. Where it is in the glass case in the car.

A. That is right. It serves the same purpose as the fire extinguisher and the axe that they have in the emergency kit.

Q. 14. What is the flashlight case made of that you use in the Pullman cars?

A. The flashlight case that we have on the car is a copper case.

Q. 15. And there is one of these flashlights in every
63 Pullman car in the United States?

A. That is correct.

Q. 16. What happened in 1939 that led the company to install flashlights in cars?

A. Well, as you gentlemen probably recall, there was a serious accident out in Wyoming where a train went into the river. It so happened that one of our conductors had a small flashlight which he found to be of great use during that accident. After it was over the President of our company decided that we better have a flashlight in every car.

Q. 17. Was that in August, 1939?

A. No. When we first started putting them on, it had been contemplated, I would say from August until about November.

Q. 18. The wreck was in August, wasn't it, that you referred to?

A. That is right. We started purchasing cases and batteries for that application in November, 1939.

Q. 19. Now, prior to actually making purchases of these batteries and flashlights for that purpose, what did you do in your department?

A. Well, when this whole idea came up we were requested by our Engineering Department to see just what types of cells were available. They told us what
64 they would expect of the cell. Their prime interest was to find one that could in most part overcome leakage, because anything of that sort which is applied to a car is subject to a lot of abuse by vibration. It is surprising how things are broken down, the physical characters on the car. So we obtained a number of different manufacturers' cells, and in checking them all we felt that the Ray-O-Vac Leak Proof had the features that we required for the application because of their method of insulating the electrodes from the outer shell; the fact that they could retain the active ingredients within the cell over quite a length of time.

Q. 20. Did these various competitive companies submit their specifications to the Pullman Company?

A. Yes, they did. They gave us engineering data on them, curves, and shelf-life, but they were just the conventional type of cell. They had not any additional features. There was no apparent guaranty that they would be leak proof in any way, shape or form.

65 Q. 21. That is, except for the Ray-O-Vac Leak Proof Cell?

A. That is right.

Q. 22. And then did you run any independent tests on your own?

A. Yes. We ran some tests. One of our service departments just merely placed several cells in the type of cases that were being implanted in the cars, and recently we checked some in our office as well, as in this other department, that had been lying in the cases for over a year. They showed no indication of any leakage. They were allowed to burn for approximately eighteen minutes. There was no apparent loss of brilliancy as far as the light was concerned.

Q. 23. About how many of these flashlight cases do you have in use, do you recall?

A. We have at the present time approximately 11,000 cases in use.

Q. 24. And you stated, I believe, that the cases in each Pullman car are inspected every six months.

A. Every six months.

Q. 25. Do you know of any instance where any of the Ray-O-Vac Leak Proof Cells have ever leaked or swelled in the flashlight cases in cars?

66 A. We have no record of any cases like that.

Q. 26. There have never been any complaints made to your department?

A. Not a one.

Q. 27. Your Pullman cars, of course, operate in all parts of the United States and under all weather conditions?

A. That is right. They are subjected to radical changes in temperature during the winter months. They may lay out in the railroad yard without any heat, and then they are heated up and brought into the depots. There are radical changes in a cell that has a metal outer covering; a metal flashlight case would have extreme sweating under those conditions, and even that has no detrimental effect on the usefulness of the case.

Q. 28. Now, of course, these flashlights that are in the cars are not ordinarily used during that six-months' period?

A. No, they are not.

Q. 20. Between inspections?

A. They would only be used in case of an accident.

Q. 30. And do you from time to time replace the cells that are in those flashlight cases?

67 A. Yes. From time to time, that is, at the six-months' inspection we may take those cells out, replace them with new ones, and then turn the cells we have taken out over to our Storage Department, and they are used by the inspector, by our inspectors and servicemen, and it is quite apparent that they get the full life of the battery after lying in the car for six months, because if they did not we would receive reports that they were failing, and our turnover would naturally increase.

Q. 31. Is it your belief that these cells that have been in the cars for six months, when put into active use, are just as satisfactory as new cells?

A. Absolutely. We have nothing to indicate the contrary.

Q. 32. Referring now to these cells when they are put into active use in your shops and in your inspection work, do you know of any cases where a Ray-O-Vac Leak Proof Cell has ever leaked or swelled?

A. No, we haven't any reports indicating that.

Q. 33. What is your opinion of the Ray-O-Vac cell for this type of service?

A. My own, as well as the opinion of our company,
68 and it is our belief that at present there is not another cell on the market that is actually leak proof.

Q. 34. You are quite familiar with the construction of the Ray-O-Vac Leak Proof Cell, are you?

A. In a general way. Nothing technical at all.

Q. 35. Well, now, will you describe the outer appearance of it, briefly?

A. The outer appearance of the cell is one of approximately the same size as other conventional cells with the exception that it has a metal outer covering which in turn is definitely insulated from the electrodes of the battery and the active ingredients.

In other words, it is practically the case of a conventional cell being completely sealed in by an outer covering.

Mr. Schroeder: That concludes the direct examination.

And in answer to cross-interrogatories proposed to him by Mr. William E. Chilton, counsel for Defendants, he saith:

XQ. 36. You buy these flashlight cases as well as the cells from the Ray-O-Vac Company?

69 XA. That is correct.

XQ. 37. They furnish the entire unit?

XA. That is correct.

XQ. 38. How does the price of those cells compare with the price of competing cells of the same general quality?

XA. Well, the price of these No. 2 Leak Proof Cells is the same price as any high-grade cell of the same type. In other words, you are not paying a penalty for the leak-proof feature.

XQ. 39. When you began to put these flashlights into Pullman cars, you decided to use a metal case flashlight, I assume.

XA. Well, that case happens to be a special one. At the same time that we checked the batteries we also checked the cases. We did not want a spotlight. We wanted a case having a bull's-eye lens to come as close to the intensity in light of a spotlight as we could get. And we did a lot of checking around, talking it over with case manufacturers, and we did not get very far.

In going into the matter with Ray-O-Vac they developed a bull's-eye flashlight with a special type of reflector that will give better brilliancy over the width of a Pull-
70 man car and the length of a Pullman car without any dark spots in it at all, which is always the case with a spotlight. We just did not want that. We wanted it to be where the porter or anyone else standing at the end of the car could illuminate the car from end to end, and the entire width of the car.

XQ. 40. Was that case made according to your specifications?

XA. We merely suggested what we wanted and the Ray-O-Vac people developed one along those lines.

XQ. 41. Were any other cases submitted to you for inspection?

XA. Oh, yes.

XQ. 42. By other companies?

XA. Yes, correct.

XQ. 43. Will you enumerate what other companies' products you considered?

XA. National Carbon. Bright Star. Winchester. And also the U. S. Electric.

XQ. 44. Did you see or inspect any cells made by General Dry Batteries?

XA. No, we did not.

XQ. 45. I believe you stated this was approximately 1939 that you put these in the cars.

XA. That is correct.

71 XQ. 46. How often do you replace the cells in these flashlights, approximately; every six months, did you say?

XA. Every six months.

XQ. 47. And you take the old cells out and give them to the shops to use?

XA. That is right. Used by watch services and inspectors.

XQ. 48. And what do you find to be the average shelf-life of these Ray-O-Vac Cells?

XA. The shelf-life is well over a year.

XQ. 49. Are there any other leak proof cells available at this time?

XA. Not to my knowledge.

XQ. 50. Have you recently made any effort to learn whether there were any other leak proof cells available?

XA. No. The reason for that is this: That the price we are paying is attractive to us, and the cell we are using serves our purpose. We have no difficulty in obtaining them. Consequently there is no need of our doing any shopping around.

XQ. 51. You are a satisfied customer?

XA. That is right.

Mr. Chilton: That is all.

Mr. Schroeder: That is all.

And further deponent saith not.

72 THOMAS RICHARD BOGUMILL, being duly sworn, doth depose and answer and say to interrogatories proposed to him by Mr. Bernard A. Schroeder, counsel for Plaintiff, as follows, to-wit:

Q. 1. Will you please state your full name?

A. Thomas Richard Bogumill.

Q. 2. What is your occupation, Mr. Bogumill?

A. I am Assistant Superintendent, of the South District shop of the Distribution Department of the Peoples Gas Light and Coke Company.

Q. 3. Are you here in answer to a subpoena by the Ray-O-Vac Company?

A. Yes, sir.

Q. 4. How long have you been with the Peoples Gas Light and Coke Company?

A. 18 years.

Q. 5. And are you on any of the committees of that company?

A. I am on the Tool Standards Committee.

Q. 6. Have you any experience with flashlights or flashlight batteries?

A. Quite a good deal.

Q. 7. How many years would you say?

A. Practically all of the time I have been there I have had some occasion to use flashlights and had some ex-
73 perience with them during all the time.

Q. 8. What use does your company make of these flashlights?

A. Well, the flashlights are used by our meter readers, our service men; men who turn on the meters and turn them off again; men who work in the street Division, have occasion to enter basements or dark places with flashlights. Anyone that works at night, of course, used flashlights because it is the only temporary lighting they have.

Q. 9. Do these flashlights always receive good care?

A. Well, they have to receive good care because they have to be ready to use at all times. A man wouldn't carry a flashlight unless it was in working order.

Q. 10. How about in your tool kits?

A. They carry a flashlight at all times. It is kept in their tool kits because they never know when they are going to get into a dark basement, and in order to see to do their work they need a flashlight. And used in the Street Divi-
sion they carry a flashlight in their tool barrel, which is
74 a 2-wheel cart that we put our tool in. They need them because they never know when they are going to get into a dark basement and they need a flashlight to work with.

Q. 11. Have you ever had any difficulties with flashlight batteries used by your company?

A. We did experience considerable difficulty from batteries that were discharged completely spewing out and damaging flashlight cases.

Q. 12. You mean the material spewed out of the dry cells?

A. Yes, sir.

Q. 13. And how would this affect the flashlight cases?

A. Well, it would short—that is, the shorting of the cell would discharge the cell and render the flashlight useless. Of course, the fact that the liquid spewed out throughout the whole casing, or the flashlight case, would affect the working parts, particularly damaging them as a result of having been discharged too far.

Q. 14. This would cause permanent injury to the casing?

A. It would.

Q. 15. Have you had any experience with the Ray-
75 O-Vac Leak Proof Cell?

A. Well, we ran some tests in 1940, and as a result of those tests we changed over in our particular section of company to the Ray-O-Vac Leak Proof Cell.

Q. 16. What do you know of the tests which you ran?

A. We compared them with the cell that we were using prior to that time as to their life, and we made an exhaustive test on the cells; that is, we discharged them completely by shorting them, and we found that the cell that we were using, the liquid came out of every cell that we tried. And those leak proof cells, the Ray-O-Vac cells, we tried did not do that. That was possibly the reason why we changed over to the new type of cell.

Q. 17. Do you know approximately how many of these leak proof cells your company has used in the last three years?

A. Well, I would venture to say that it is between 80,000 and 100,000 cells a year. That is about an average figure. I know that our own particular Division used about 35,000 a year.

Q. 18. Are you familiar with the guaranty on the
76 Ray-O-Vac Leak Proof Cell?

A. I know there is a guaranty on the outer casing, and I believe it is to the effect that they guaranty to replace any flashlight case that is damaged by the reason of the liquid spewing out.

Q. 19. How about the cells? Do they guaranty those?

A. I imagine that guaranty covers. I am not familiar with that. I haven't looked at one recently.

Q. 20. Have you ever had occasion to avail yourself of that guaranty?

A. Not yet.

Q. 21. That is the leak proof cells that you have used have been satisfactory?

A. So far they have been very satisfactory.

Q. 22. In these repair kits or tool kits that your street repairmen use, is it unusual to have a flashlight lie in one of those cases for some period of time without inspection?

A. Well, it does not take very long,—the time between Friday, for instance, and Monday morning is sufficient time for a set of batteries to become completely discharged and damage the case. In that case they cannot be used
77 any further. That is time enough, and that has happened.

Q. 23. But not with the Ray-O-Vac Leak Proofs?

A. Not since we have had them, not with that type of cell.

Mr. Schroeder: That is all.

You may cross examine.

And in answer to cross-interrogatories proposed to him by Mr. William E. Chilton, counsel for Defendants, he saith:

XQ. 24. How long does a flashlight, one set of batteries, last a meter retader?

XA. About 15 to 20 hours of operation.

XQ. 25. What would that be in terms of time, days employed?

XA. An average of four or five days. It may last him a week, and it may not. It depends a lot on how much he would have to use it, and, of course, how many dark places he would get into.

XQ. 26. What flashlights and cells were used prior to the adoption of the Ray-O-Vac Cells?

XA. We were using the Ever-Ready.

Q. 27. Did you make any comparative tests with the Ray-O-Vac Leak Proof Cell and any other Cells?

XA. Just the Ever-Ready cells at that time, at the time we were having our difficulties.

78 XQ. 28. You have never tested or used cells or batteries made by General Dry Battery, have you?

XA. That is personally I have not had any experience with them.

XQ. 29. Well, has the company, to your knowledge?

XA. I do not know. I could not tell you that.

XQ. 30. Do you know whether or not there is available at this time any flashlight cells that can meet your requirements in respect to leak proof?

XA. As far as I know there are not any other. I have

never had any occasion to use them or try them out or test them so could not say if there were any other kind.

XQ. 31. Is this spewing of the liquid caused by the shorting?

XA. I would say it is caused by the complete discharge of the cell.

XQ. 32. What I am getting at: Do they leak on the shelf when not in use?

XA. If you put it on a shelf and shorted it, it would discharge.

XQ. 33. Well, you mean by throwing on the switch of the battery?

XA. No. I am talking about setting a battery on the shelf. If you short it, as you have mentioned, by put-
79 ting a wire from one end to the other, it will discharge and then spew all over. That is, a direct short.

XQ. 34. What I mean is: Take a flashlight with three or four cells in it, and it is a new case and new cells, and you put it on the shelf, and it is not shorted. Is there any tendency for leakage to occur until it is put in use?

XA. Well, I really could not answer that. I have never tried putting a new set of batteries on the shelf with the switch turned off.

XQ. 35. Is it not the shorting of the cell that causes the spewing, leaking?

XA. I would say it is the complete discharge of the cell. The flashlight could be used up until a certain time and have sufficient light perhaps to see your way around. You could turn off the switch, put the flashlight away, and when you came to pick it up again it would be completely discharged and spewed out throughout the case.

XQ. 36. These cells, Ray-O-Vac Cells, are enclosed in a metal case, are they not?

XA. Yes, sir.

XQ. 37. And have a metal cover, do they not?

80 XA. Well, they have got a complete metal case.

XQ. 39. Top and bottom?

XA. That is right.

XQ. 39. Isn't the bottom exposed so as to make a terminal for one connection? Isn't the lowermost cell exposed so as to form a terminal for the Unit?

XA. Yes. It has to.

XQ. 40. Have you opened up and inspected these Ray-O-Vac Leak Proof Cells yourself?

XA. No, sir, I did not.

Mr. Chilton: That is all.

And in answer to redirect interrogatories proposed to him by Mr. Bernard A. Schroeder, counsel for Plaintiff, he saith:

RDQ. 41. Have you noticed any effect of temperature on the shelf-life of the cell?

RDA. No, I have never noticed that.

RDQ. 42. Your conditions are practically uniform?

RDA. That is right.

We use the cells as fast as we can get them.

RDQ. 43. What is your practice in replacing cells in flashlights?

RDA. When a man comes in and asks for a new set of batteries we usually test them and if we think they have sufficient life to go another day we ask them to use
81 them the following day. If it appears that they will run out on them before they get their work done the next day, we do not ask them to use them any longer. The men usually come in and ask for refills before we turn them in.

RDQ. 44. Have you had occasion to examine any of the old type cells, not referring to the Leak Proof,—the played-out cells: have you observed the condition of the zinc case?

RDA. No, sir.

RDQ. 45. You do not know from what part of the cell the leakage occurs?

RDA. Well, from my observation I notice that the leakage occurred through the small opening on the top of the case. And, in general, it seemed like it would form all the way around the whole outer shell. I did not look at it in detail, but those are two points that I notice the stuff came out of.

RDQ. 46. That is on the sides of the cell and up above the center of the metal cap?

RDA. That is right.

There is a small opening in the center of the metal cap.

RDQ. 47. Now, some of these flashlights that are only used for emergency work, those cells would not be re-
82 placed every week, would they? With your repair tools, for instance. The tool chest has a flashlight in it. You would not go around and replace those?

RDA. Oh, no, no. We do not need to replace them unless they are being used. We do not know that they need to be replaced.

In other words, the man that uses them lets us know as soon as they are discharged. And the men that have flashlights use them all the time. So there are no occasions for flashlights to be lying around not in use to any extent at least.

RDQ. 48. Your practice is to use the cells until they fail to give a satisfactory life?

RDA. That is right.

Mr. Schroeder: That is all.

And in answer to reeross-interrogatories proposed to him by Mr. William E. Chilton, counsel for Defendants, he saith:

RXQ. 49. The Leak Proof Cells made by Ray-O-Vac have a metal cover extending all the way across the top, do they not?

RXA. Yes, it is metal.

RXQ. 50. Is there a vent opening in that cover anywhere?

83 RXA. No. There is no opening in the top. That is the point at which I meant the other cell has the small opening here, and that is one of the places it came out, and it came out around this. (Indicating.)

Mr. Schroeder: Will you have the record show that the witness is pointing to the top of the Ray-O-Vac Cell?

Mr. Chilton: The Ray-O-Vac Cell.

RXQ. 51. I hand you this Ray-O-Vac Cell and ask you if there is a vent opening in the cap over the carbon button there?

RXA. I would say there was not.

RXQ. 52. If there was an opening in that cap would there be a tendency for the contents to ooze through there?

RXA. I would not be able to answer that, I don't know.

RXQ. 53. Were all of the Ray-O-Vac Cells which you have used imperforate so far as that cap is concerned?

RXA. They were solid.

Mr. Chilton: That is all.

Mr. Schroeder: That is all.

And Further Deponent Saith Not.

84 STIPULATION.

It is stipulated by and between counsel that the exhibits offered with the above deposition may be retained by counsel to be produced at the trial at Danville.

It is further stipulated that the signatures of the witnesses to the depositions are waived.

85 State of Illinois, } ss.
County of Cook. }

(Caption—240-D)

I, George J. Drobnis, a Notary Public within and for the County of Cook and State of Illinois, do hereby certify that the foregoing deposition of Meyer Friedman, Leonard D. Karcher, D. C. Curtis, William R. Steinmayr and Thomas Richard Bogumill were taken on behalf of plaintiff, in pursuance of the notice hereto annexed, before me, at Room 2800, 141 West Jackson Boulevard, on the 16th day of April, 1942; that each of said witnesses was by me duly sworn before the commencement of his testimony; that the testimony of each of said witnesses was taken stenographically by me and afterwards transcribed under my direction; that the opposing parties, Goodyear Tire & Rubber Company, Inc., Defendant, and General Dry Batteries, Inc., Defendant Intervener, were represented by
86 Counsel during the taking of said testimony; that signatures to said depositions were waived by the parties; that the exhibits introduced during the taking of said testimony were retained by respective counsel; that I am not connected by blood or marriage with either of said parties, nor am I an employee or attorney or counsel of any of the parties, nor am I a relative or employee of such attorney or counsel, or financially interested in the action, or interested directly or indirectly in the matter in controversy.

In Witness Whereof I have hereunto set my hand and affixed my seal of office at Chicago, Illinois, in said County, this 18th day of April, A. D. 1942.

(Signed) George J. Drobnis,
*Notary Public.*

(Seal)

87 Mr. Schroeder: I would like to offer a stipulation entered into between Counsel on May 21, 1942, as Plaintiff's Exhibit No. 5. Would your Honor have me read this?

The Court: Suppose you hand it up to me. It may be received in evidence.

Which said Plaintiff's Exhibit No. 5, is in words and figures following, to-wit:

88 PLAINTIFF'S EXHIBIT NO. 5.

* * (Caption—240-D) * *

STIPULATION.

It is hereby stipulated, by and between the parties to the above entitled suit, as follows:

1. That regular printed copies or photostatic reproductions of United States and foreign Letters Patent, or any printed publications, shall be submitted, subject to the correction of errors, as satisfactory proofs of such Letters Patent and printed publications, without certification, and that the printed dates of filing, sealing, publication, or delivery, appearing thereon, shall be taken, subject to the correction of errors as establishing such dates:

2. That the incorporation and residence of the parties is as alleged in paragraph 1 of the bill of complaint and paragraphs 1 and 2 of the counterclaim.

89 3. That prior to the filing of the bill of complaint, the plaintiff was and now is the owner of the entire right, title and interest in and to United States Letters Patent No. 2,198,423, issued April 23, 1940, to Ray-O-Vac Company.

4. That Defendant, General Dry Batteries, Inc., is the manufacturer of the General Protex cell and also the Goodyear Leak-Proof cell charged in this suit to infringe.

5. That General Dry Batteries, Inc. had knowledge of United States Letters Patent No. 2,198,423 at the time it began the manufacture of cells of this type.

6. That General Dry Batteries, Inc. was notified of the alleged infringement on July 26, 1941.

7. That for its charge of infringement Plaintiff relies on claims 1, 2, and 3 of Anthony Patent No. 2,198,423.

8. That plaintiff may introduce in evidence, without objection, a letter dated February 26, 1942, to the Ray-O-Vac Company from Thomas L. Clark, Lieut. Col., Signal Corps, Officer-in-Charge of Chicago Signal Corps Procurement Division.

9. That a copy of the January 1942 issue of "Electrical Merchandising" magazine, published by the McGraw-Hill Publishing Company, may be introduced into evidence and the figures on pages 6 and 7 of said magazine accepted as the estimate of an unbiased expert as to the number of battery cells for flashlights sold during the years 1932-1941 inclusive.

10. That the V4-F lantern battery, identified as Defendants' Exhibit A-4, was made by General Dry Batteries, Inc., and in public use and on sale continuously
90 since 1935.

11. That the attendance fees of reporter and cost of original copy of the transcript may be included as costs to the winning party.

(Signed) Chritton, Wiles, Davis & Hirschl,
*Attorneys for Plaintiff.*

Signed William E. Chilton,
*Attorneys for Defendants.*

Cleveland, Ohio.
May 21, 1942.

91 Mr. Schroeder: I would like to offer in evidence as Plaintiff's Exhibit No. 6, a copy of Patent No. 2,198,423, the patent in suit.

I would also like to offer the file wrapper of the instant patent and the contents as Plaintiff's Exhibit No. 7.

The Court: PLAINTIFF'S EXHIBITS NOS. 6 and 7 may be received in evidence.

92 Mr. Schroeder: I now offer the later Anthony patent, No. 2,243,938, as Plaintiff's Exhibit No. 8.

The Court: Plaintiff's Exhibit No. 8 may be received in evidence.

Which said PLAINTIFF'S EXHIBIT NO. 8, is in words and figures following, to-wit:

93 Mr. Schroeder: Plaintiff now offers in evidence Plaintiff's Exhibit No. 9, being the file wrapper of Patent No. 2,243,938, the file wrapper and contents.

The Court: It may be received in evidence.

Which said PLAINTIFF'S EXHIBIT NO. 9, is in words and figures following, to-wit:

94 DONALD W. TYREL, a witness called on behalf of Plaintiff herein, being first duly sworn on his oath, upon examination-in-chief by Mr. B. A. Schroeder, deposed and testified as follows:

Mr. Schroeder:

Q. State your full name.

A. Donald W. Tyrel.

Q. Where do you reside?

A. 659 Farwell Terrace, Madison, Wisconsin.

Q. What is your occupation?

A. I am Vice-President of the Ray-O-Vac Company and President of Blake Manufacturing Company of Cleveland.

Q. Is the Blake Manufacturing Company a subsidiary of Ray-O-Vac?

A. It is.

Q. What does it manufacture?

A. Flashlight casings.

Q. What was your education prior to coming into the Ray-O-Vac Company?

A. I graduated from Wisconsin, with a Bachelor of Science degree in Chemical Engineering in 1917.

Q. When did you go to the Ray-O-Vac Company?

A. 1920.

Q. Where were you between 1917 and 1920?

A. In the Army.

Q. You have been in the battery and casing business since 1920?

A. Yes, sir. I have been with Ray-O-Vac or a
95 subsidiary of it since then—the French Battery and Carbon Company, now Ray-O-Vac.

Q. Those companies are all the same but merely a change of name?

A. That is right.

Q. How long were you with the Ray-O-Vac Company prior to going to the Blake Manufacturing Company?

A. Ten years.

Q. At Madison?

A. Madison, Wisconsin.

Q. When did you return to Madison?

A. I just returned in the last month.

Q. Have you had any experience with difficulties in flashlights and flashlight casings?

A. Yes, I have had a great deal of it.

Q. Will you describe, briefly, some of your experiences?

A. My greatest difficulty with flashlight cases, evidenced by returns and complaints, is caused by flashlight cells which have oozed or swollen, having been left in the flashlight for a long period of time, it was impossible to remove them, or difficult, without damaging or destroying the case.

Q. I will hand you a flashlight case and ask you if you can tell us anything about that?

A. That flashlight case is in particularly bad condition. From an examination of it, I would say it is due entirely to leaving a discharged cell in it. The cell was completely discharged and swollen; the corrosive liquid of the
96 electrolyte which has come out, has corroded the fittings on the case; also warped the fibre tube. In fact, it has undoubtedly made that case inoperable, making it impossible of repair.

Q. Would you say that is a typical example of swelling and leaking in flashlight casings?

A. Yes, I would say that happens in a great many cases.

Q. What is the condition of the industry as regards the competition? Are there many manufacturers in this business, or just a few?

A. You are speaking of the battery business?

Q. Batteries.

A. Relatively few; I would say half a dozen leading manufacturers.

Q. Is the business fairly well divided between them? Would you say competition is strong or weak?

A. I would say it is strong.

Q. In the manufacture of casings, what is the design of the case, in diameter, as compared with the diameter of the cell?

A. We always make as much allowance as possible, leading towards the side of having more space than necessary, as far as the diameter of our tubes go, so as to allow for cell expansion and make our difficulties of sticking cells less. We also provide, in our design, some means of removing the cells; the last year or two, we made a practice. We provide holes in the insulation so that cells which
97 start to stick can be pushed out.

Q. I will hand you a part of a flashlight and ask you to point out the holes you are referring to?

A. These holes in the lamp are provided so that a rod or screw driver or some other means can be inserted and push out the cells which are starting to stick.

Mr. Schroeder: I would like to offer the first flashlight the witness referred to in evidence as PLAINTIFF'S EXHIBIT NO. 10.

The Court: Plaintiff's Exhibit No. 10 may be received in evidence.

Mr. Schroeder: And the flashlight case with the holes in the end for knocking out the cells, I wish to offer as PLAINTIFF'S EXHIBIT NO. 11.

The Court: Plaintiff's Exhibit No. 11 may be received in evidence.

Q. Is any provision made at the present time in plastic casings?

A. We have a design, a plastic case, in which we have provided a hole in the base for the same purpose. This is the type of case we call the muzzle loading, so we provided a means of pushing the cells out from the bottom.

Q. I hand you Plaintiff's Exhibit No. 1, and ask you if you can tell us anything about that?

A. This is a caution slip which I wrote, at the request of Montgomery-Ward, after we had had a great deal of trouble with oozing cells and corroding and damaging our flashlights. They, in turn, returned them to us, asking
98 credit. It was not through our fault that the swelling occurred and the cells shorted, causing the oozing and we objected strenuously and proved to them that it was not the fault of the flashlight, but it was the heavy drawing on the battery, and they requested us to put a slip in, cautioning their customers against this difficulty.

Q. I hand you Plaintiff's Exhibit No. 2, which bears the Blake mark. Tell us what that is?

A. It is a tag we put on the Blake Brand flashlights, which describes the features of the flashlights and also caution on the rear of the card, stating the difficulties and warning the purchaser against leaving the cells in the flashlight.

Q. I hand you Plaintiff's Exhibit No. 3, so marked for identification, and ask you if you can tell who manufactured this particular case?

A. This flashlight case was manufactured by the Blake Manufacturing Company.

Q. Do you know what Company sells those at retail?

A. Montgomery Ward.

Q. I hand you Plaintiff's Exhibit No. 4 and ask you if you can tell us who manufactured that casing?

A. It was manufactured by the Blake Manufacturing Company.

Q. Can you tell us who sells those and what cells are in that casing?

A. These are Leak Proof cells, manufactured for Sears Roebuck Company by the Ray-O-Vac Company.

99 Q. Do these cells have any warning against leakage?

A. No.

Q. I hand you a box, containing eight cells, and ask you whether those are typical commercial cells, other than of the Leak Proof type?

A. Yes. These are commercial cells I have seen offered for sale in retail stores.

Q. Do those cells have any caution to users?

A. Yes, sir. All of them have a caution against leaving the cells in the flashlight after they are discharged.

Q. Will you read the names of each of those cells into the record?

A. Bond Mono cell, New Haven, Connecticut. 2: Winchester Unit No. 1511, New Haven, Connecticut. 3: Scout, United Drug Company, Boston. 4: Tiger Heavy Duty Cells, Gambel and Company. 5: Ward Supreme Quality, Heavy Duty Cell, Montgomery Ward. 6: Bright Star Industrial Flashlight, Clifton, New Jersey. 7: National Carbon Company, New York, and there is a second Mona Cell—Bond Mona cell, Bond Electric Corporation, New Haven.

Mr. Schroeder: I would like to offer the box of cells in evidence, as PLAINTIFF'S EXHIBIT NO. 12, with the individual cells in the order read by the witness, as Plaintiff's Exhibit No. 12-1, 12-2, through 12-8.

Mr. Chilton: Are any of these cells made by the Defendant Intervenor?

Mr. Schroeder: They have not been so identified.

The Court: They may be received in evidence.

100 Will you read the caution printed on the Winchester Unit cell of this exhibit?

A. "Chemical reaction common to all exhausted flashlight cells may corrode and ruin your flashlight if dead cells are not promptly removed".

Q. Is there a date on that particular cell?

A. Yes, sir. September, 1943. "For best results, put in use before September, 1943".

Mr. Schroeder: That is all.

*Cross-Examination.*

And the witness, on cross-examination by Mr. Wm. E. Chilton, deposed and testified further as follows:

Mr. Chilton:

Q. What causes the swelling of cells in flashlights.

A. The discharge—the passage of electric current forms certain compounds within the cell and cell oxidation takes place. The combustion of elements in the cell oxygen chloride, zinc ammonium and other complex elements, which occupy larger space than the original elements, causing pressure within the cell.

Q. How much pressure exists in a cell under normal useage?

A. I have never measured it; I could not testify to that.

Q. No you have any idea of the approximate pressure reached within the cell?

A. No, sir.

101 Q. You have Leak Proof on all your cells, do you not?

A. Yes, sir.

Q. You mean to say you never have a leaky cell?

A. No, sir.

Q. What percentage of them leak?

A. I haven't any records as to that.

Q. I notice in this box of cells, identified at Plaintiff's Exhibit No. 12, there is a vent in the top of that brass cap on the carbon electrode, is there not?

A. It appears to be broken through.

Q. Is that the normal construction of that cell, do you know?

A. I could not say.

Q. Do gases escape through that vent?

A. Yes, sir.

Q. Is that the purpose of it?

A. I didn't make the cell, so I can't testify to that.

Q. In the Anthony patent, the vent in the brass cap, what is the purpose of that vent?

A. To allow the gas to escape.

Q. Can electrolyte escape through that vent?

A. It is not probable, but I assume possible.

Q. I note in the commercial Leak Proof cell, you have eliminated that vent. Why was that?

A. Thought it was unnecessary.

Q. Is this cell, your Ray-O-Vac cell, a hermetically sealed cell?

A. I could not testify to that. I never tested it.

102 RALPH E. RAMSEY, a witness called on behalf of Plaintiff herein, being first duly sworn on his oath, upon examination-in-chief by Mr. B. A. Shroeder, deposed and testified as follows:

Mr. Schroeder:

Q. Please state you full name.

A. Ralph E. Ramsey.

Q. Where do you reside?

A. 7 Padgett Road, Madison, Wisconsin.

Q. What is your educational background?

A. Chemical Engineering, University of Wisconsin, class of 1917, with a degree of Chemical Engineering in 1920.

Q. Between 1917 and 1920, where were you?

A. I was in the Army.

Q. What did you do from 1920 to 1925?

A. In the period from 1920 to 1925, I instructed in Chemical Engineering at the University of Wisconsin, in subjects of Pyrometry, gas analysis and electrical chemistry.

Q. When did you start with the Ray-O-Vac Company?

A. About December, 1925.

Q. You have been with the Company continuously since then?

A. I have.

Q. What is the nature of your duties with the Ray-O-Vac Company?

A. I have charge of the research and development section and also of the control and testing of the Company's products.

Q. Will you explain what you mean by control of the Company's products?

103 A. We have an analysis control of all our materials in the manufacture of dry cells, chemical control of

all solutions and mixes which we make in the factory and electric test control of the finished products.

Q. Do you run tests, periodically, on the products of the Company?

A. Yes, sir, each day's production is subjected to test.

Q. Can you tell us approximately how many cells you have on test at any given time?

A. Approximately, I should say, a hundred and twenty-five thousand at any one time; about forty thousand cells in a discharge test, and eighty thousand on storage.

Q. Will you tell us, briefly, what physical changes take place in a cell as it is discharged?

A. Well, the exact nature will depend on the age of the cell and the type of formula used, and also the type of service to which the cell is subjected, but in general, the reaction of all cells is the solution of zinc in ammonium chloride, a formation of zinc chloride in the anode of the cell, and the discharge of the ammonium ion at the cathode. The ammonium splits up into N. H. three and hydrogen; the hydrogen is depolarized and oxidized; the N. H. three compound eventually forms a complex element. The zinc ammonium chloride with zinc chloride, producing on the anode under certain conditions,—prolonged discharge, 104. the zinc ammonium chloride compound is changed to oxidized chloride, or basic zinc compounds. These compounds occupy more space and exert pressure because of the fact of increased volume in the cell along with the discharge, generates a certain amount of heat, depending on the current of the apparatus and the internal resistance of the cell. The heat may or may not soften the seal of the dry cell.

Q. When the heat is sufficient to produce a softening of the ordinary seal, what can you notice? What physical change do you notice in the exterior of the cell?

A. Well, usually, in a wax top cell, we normally try manufacturing a concave surface and a cell subjected to heat and internal pressure, tends to form a doughnut shape. The seal may be blown out of the cell.

Q. That is from the internal pressure of the solids?

A. Yes, or it may be a combination of physical pressure from the solid, or in extreme discharge, or both.

Q. Have you ever eperimented with the Leak Proof Ray-O-Vac cell, leaving off this reinforcing bottom?

A. Yes, sir, we have made certain tests.

Q. I hand you a cell and ask you if that is the one you are now telling us about?

A. This construction is the same as the normal construction, except the steel reinforcing plate is omitted from the bottom, and the pressure developed in the cell has rounded out the bottom of the zinc can.

Q. Do you suppose that would continue if the cell was discharged further, or as it is discharged further? If
105 there would be any more bulging effect?

A. There is a possibility. I don't know. The cell might vent itself in another place.

Mr. Schroeder: I would like to offer this cell as PLAINTIFF'S EXHIBIT NO. 13.

Mr. Chilton: This is the ordinary cup without the double bottom?

Mr. Schroeder: Right.

The Court: It may be received in evidence.

Q. In your experience with the ordinary type of dry cell, where does the perforation usually occur first?

A. The zinc will perforate where it has been subjected to local action. That usually takes place at the water line, the junction of the electrolyte and the air space, or it may occur at the junction between the zinc can and the space member, itself.

Q. On the inside of the cell?

A. Yes, sir.

Q. What is the space ordinarily used?

A. That depends on the space which is used, normally one-sixteenth or a quarter of an inch up. That is common to all designs of cells.

Q. I hand you this box, Plaintiff's Exhibit No. 12 and ask you if you are familiar with such cells and the warnings printed thereon?

A. Yes, I recognize these as commercial cells.

Q. How far back do you recall seeing such warnings
106 printed on commercial dry cells?

A. Well, since I was first associated with the battery industry in 1925, specifically.

Q. This liquid which leaks out of the perforated cells, will you tell us something about the properties of it? Whether it is corrosive, or just what the undesirable features of it are?

A. Well, it is a strong solution of zinc chloride with some ammonium present—I should say probably forty or

fifty percent of zinc chloride. It is corrosive, especially in combination with ammonium, and it attacks most metal with rather an irritative effect.

Q. Irritative effect on what?

A. Skin and hands.

Q. Have you made any comparative tests of the performance of your Leak Proof cell and the ordinary Ray-O-Vac cell with the wax top of the same—

Q. Yes, we have now checked the performance of the regular D-size flash light cell with that of the Ray-O-Vac Leak Proof cell, both varieties being compounded with the same formula.

Q. Do you have the figures which you made or the record you made of those tests?

A. We have run a delayed service test in which both cells were sixteen months old at the beginning of the discharge.

Mr. Chilton: Do you have a sample of the D-cell he is talking about?

A. May I answer?

Q. Yes, sir.

107 A. The ordinary D-size cell is the standard designation for the flashlight cell.

The Court: The flashlight batteries you buy in the store?

A. Yes, sir.

Mr. Chilton: Like those in the box? The one you are talking about is one of your own make?

A. Yes, sir, that is right. To resume, when both cells were sixteen months old, they were placed on a light industrial flashlight test, which is a standard test. The Leak Proof cell, although it has a slightly smaller zinc can and contains less active materials, showed an increase over the larger D-size cell in capacity. Compared with the original capacity, it showed a smaller loss in service. I have the figures here if I can refer to them.

Mr. Schroeder: I now offer the commercial Ray-O-Vac Leak Proof cell as PLAINTIFF'S EXHIBIT NO. 14.

The Court: It may be received.

A. In this comparison, with our "Q" mix, the initial capacity of the wax top cell was seven hundred and twenty-five minutes. The initial capacity of the Leak Proof cell, of the same formula, was seven hundred and thirty-two minutes. At the age of sixteen months, the initial capacity

of the wax top cell was five hundred and ninety-seven minutes and that of the Leak Proof, six hundred and forty-eight minutes, giving a loss in capacity of one hundred and twenty-eight minutes for the wax top cell and 108 eighty-four minutes for the Leak Proof cell. It is a question of percentage. There is a seventeen and six-tenths percent loss for the standard wax top cell and eleven and a half percent loss for the Leak Proof cell.

Q. How mony cells? Do you have the average for the number of cells?

A. Yes, sir. Five cells tested in each lot.

Q. What does the total figure show—the average figure?

A. I have read the average.

Q. That was the average?

A. Right.

Q. Does the Bureau of Standards in Washington run tests on your cells?

A. The Bureau of Standards collects samples of dry cells once a year for routine tests for information of Government purchasing agencies.

Q. That is done as a matter of routine?

A. Yes, sir, that is regular procedure.

Q. Did it test the Leak Proof cell?

A. In June, 1941, the Bureau representative collected samples of our Navy mix formula, both in the wax top, D-size cell and in the Leak Proof construction, and they were subjected to regular tests.

Q. Did you receive any communication from the Bureau of Standards, telling you of the results of that test?

A. The Household intermittent test has just been completed on those two types of cells and I have a report, 109 dated May 29, 1942, signed by Lyman J. Briggs, Director of the National Bureau of Standards, Washington.

Q. When was it received?

A. Yes, sir.

Q. Here in Danville?

A. Here in Danville.

Q. Will you read us the results of the test of the Bureau of Standards on these cells?

A. Date received at this Bureau, June 23, 1941. Date of start of test, August 13, 1941. Wax top, August 21st. Type of cell, Navy type No. 2 wax type. Navy type Leak

Proof. Test, intermittent test, resulting in minutes of discharge. No. 2 wax top—there are six cells listed.

Q. Do they have the average worked up?

A. Yes, sir.

Mr. Schroeder: I would like to offer the letter in evidence.

A. The average performance of the wax top was eight hundred and sixty-four minutes; that of the Leak Proof, nine hundred and sixty-seven. Average, six cells.

Mr. Chilton: There were the products of Ray-O-Vac?

A. Yes, sir.

Q. And the same formula was used in the wax top cells as in the Leak Proof cells?

A. Yes, sir. The formula is identical. The mix and electrolyte. The difference is in the smaller amount of the materials used in the Leak Proof construction because of the smaller size zinc can.

110 Q. There is less zinc and less depolarizing mix, and the electrolyte is the same, but in spite of that, the Leak Proof out-performs the regular Ray-O-Vac cell?

A. Yes, sir. That is true on any extreme delayed service test, or in any service in which the shelf life of the cell is affected.

Mr. Schroeder: I would like to offer as PLAINTIFF'S EXHIBIT NO. 15, the letter from the National Bureau of Standards, dated May 29, 1942, addressed to Ralph E. Ramsey, and signed by Mr. Briggs the Director.

Mr. Chilton: If the Court please, I don't see the relevancy of this exhibit. It is a comparison by the Bureau of Standards between Ray-O-Vac and another cell they manufacture.

The Court: It may be received, subject to objection.

Q. Do you run tests on competitive cells?

A. Yes, sir, we do.

Q. What kind of tests do you run?

A. Quarterly tests on the principal brands of competitive cells.

Q. What do the tests show on the relative performance of the Leak Proof cell and your principal competitive brands of the same size?

A. Our tests indicate that Leak Proof cell has greater performance on the standard, recognized flashlight tests than any competitive cell.

Q. Do you advertise the results?

111 A. We do.

Q. In what magazines do you advertise?

A. Life, Colliers', Saturday Evening Post and sporting magazines.

Q. Do any of these magazines require proofs of your claims on performance?

A. The Curtis Publishing Company requires corroboration of claims before they accept advertising material of that nature.

Q. I notice a copy of an ad of the Saturday Evening Post, dated November 15, 1941?

A. Yes, sir.

Q. "Ray-O-Vac leakproof cell out-performs by 46% the average for six leading competitive cells."

Did you make the test to back up that assertion in that advertisement?

A. Yes, sir, I furnished the figures for the advertisment.

Q. Those figures bear out the claim?

A. The cells were tested from March, 1940 through June, 1941, comprising from four to six watts, of cells of six manufacturers, other than Ray-O-Vac. The test involved the light industrial flashlight test, heavy industrial flashlight test, and household intermittent test. The average of the six brands was compared with the performance of the Leak Proof cell on each of these tests and the
112 combined average was forty-five and forty-two hundredths percent.

Q. Has the Leak Proof cell been advertised nationally?

A. Yes, it has.

Q. Will you look at this volume of advertising and tell us if those are correct copies of the ads in Life, Collier's and the Saturday Evening Post, and the others you have mentioned?

A. Yes, sir.

Mr. Chilton:

Q. Those six cells you speak of include the "Q" cell?

A. The formula—our designation of formula is "Q".

Mr. Chilton: I mean the alleged infringing cell.

A. No because the alleged infringing cell wasn't produced at this time.

Mr. Schroeder: I would like to offer this volume of sample advertising as PLAINTIFF'S EXHIBIT NO. 16.

Mr. Chilton: To which the Defendant objects for the

reason that they are irrelevant, they have nothing to do with the infringing cell and those are self-serving statements.

The Court: That is probably all true.

Mr. Schroeder: We offer it merely to show that the cell was advertised nationally.

The Court: It may be received for that purpose, to show it was advertised nationally; whether they are pertinent, I am not deciding.

Q. Does the Signal Corps of the United States 113 Army use Leak Proof cells?

A. Yes, sir, they use it as their B. A. cell. That is the Signal Corps' designation for the D-size flashlight cell.

Q. Do you know whether they run tests themselves?

A. Yes, I know.

Q. What was the result communicated to Ray-O-Vac as a result of their tests?

A. The Ray-O-Vac products were approved.

Q. Are you familiar with the publications or primary data as published in textbooks, magazines and pamphlets put out from time to time?

A. I am.

Q. Have you found any discussion of the problem we have been discussing—swelling and leakage?

A. Yes, it has been more or less taken for granted, but there is specific mention made of the problems of leakage and swelling.

Q. I hand you copyrighted in 1928 and ask you to identify that?

Mr. Chilton: What is the purpose of this?

A. I am familiar with this.

Mr. Schroeder: We want to show that this problem that the Leak Proof Ray-O-Vac cell solved, has been known in the industry and discussed, right straight through; that the men in the industry had it before them all along, and we thought we would not put in a few pamphlets on the subject.

114 PLAINTIFF'S EXHIBIT NO. 15.

U. S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington

Address Reply To
National Bureau of Standards,
GWV:GH

In Your Reply
Refer To File
1-9

May 29, 1942

Mr. R. E. Ramsay
Hotel Wolford,
Danville, Illinois.

Subject: Test of Ray-O-Vac Dry Cells.

Dear Sir:

In response to your telephone request to Dr. Vinal on May 28, test results on flashlight cells made by your Company are listed below:

Date received at this Bureau—June 23, 1941
Date of start of test—Aug. 13 (wax top), Aug. 21 (leak proof)
Types of cells, Navy type No. 2 wax top,
Navy type No. 2 leak proof.
Test: Household Flashlight Intermittent test.

Test Results, minutes of discharge:

| Cell No. | No. 2 Wax top | Cell No. | No. 2 Leak proof |
|---|---|---|---|
| 1343 | 933 | 1368 | 1090 |
| 1344 | 798 | 1369 | 948 |
| 1345 | 903 | 1370 | 1035 |
| 1346 | 864 | 1371 | 1065 |
| 1347 | 848 | 1372 | 945 |
| 1348 | 837 | 1373 | 818 |

Respectfully,
(Signed) L. J. Briggs,
Lyman J. Briggs,
*Director.*

115 Mr. Chilton: We concede that leakage has been a problem for a long time.

The Court: And generally recognized.

Mr. Chilton: Yes, sir.

Mr. Schroeder: And there was no solution prior to that of the petitioner.

Mr. Chilton: We won't concede that.

The Court: That isn't part of the pamphlets. In view of that, is it necessary to offer the contemporaneous comments? I suppose they were made prior to the time you came into the market and solved the problem commercially.

Mr. Schroeder: I think that is all right.

Q. The General Dry battery pamphlet, dated September, 1938—that was after the Anthony application was filed. I would like to offer that. Is there any objection?

Mr. Chilton: We admit that is their publication.

The Court: The exhibit may be received. What is that exhibit number—seventeen.

Mr. Schroeder: I would like to call the attention of the Court particularly to the fly leaf and the first page, two statements in this pamphlet.

Which said offer is in words and figures following, to-wit:

116 PLAINTIFF'S EXHIBIT NO. 17.

My desire is ..... that mine adversary had written a book.

Mr. Schroeder: And the second paragraph over here on the booklet, Exhibit No. 17:

"There is placed in every "dry" cell all the electrolytic solution which the mix and separator will hold by absorption. Sometimes, under heavy continuous drains or accidental short circuiting, this moisture is increased by the formation of additional water in the cell—by the combination of hydrogen (from the ammonium chloride) with the oxygen (from the manganese dioxide). Under such conditions the cell tends to exude solution, and it is because of this that the causes should be avoided and spent cells removed from flashlight and other metallic containers."

117 Q. Do you know the shelf life of the Ray-O-Vac leak proof cell?

A. After it has been manufactured and ready for market and stays on the shelf before it is delivered to the consumer? We don't know at this time because the first ones are still on test.

Q. I hand you two red covered cells and ask you if you can identify these?

A. Yes, sir, they were made in 1938, September, 1938.

Q. Have they been in your possession since that time?

A. They have been in the laboratory since that time.

Q. Have they been subjected to any use?

They have not been subjected to use; simply stored.

Q. Can you demonstrate whether those cells have any life?

A. That one is all right; it has a rather dirty cap. They are both O. K.

Mr. Chilton: They are your regular line of products?

A. That is one of the early models, you might say, experimental. They are not commercial cells.

Mr. Schroeder: I would like to offer one of the cells in evidence as Plaintiff's Exhibit No. 18.

The Court: PLAINTIFF'S EXHIBIT NO. 18, so marked for identification, may be received in evidence.

Mr. Schroeder: That is all.

*Cross-Examination.*

And the witness, on cross-examination by Mr. Wm. E. Chilton, deposed and testified further as follows:

118 Mr. Chilton:

Q. What was the purpose of making up those cells, as Exhibit No. 18?

A. Well, they were experimental cells—laboratory.

Q. What is the purpose of this experiment?

A. I can't answer that question. That is, we are continuously making experiments and designs. Perhaps if you would re-word your question.

Q. How does this compare with the present commercial product?

A. That is a different size can; it is a larger cell in diameter than our Leak Proof cell.

Q. How about the chemical contents?

A. It is a different formula.

Q. It has a metal top?

A. It is a different top. It happens to be brass—that particular one.

Q. Is it vented at the top?

A. No.

Q. Is this top mechanically secured to the outer case?

A. Yes, sir.
Q. And been insulated electrically from it?
A. Yes, sir.
Q. Is this a drawn can?
A. Right.
Q. No double bottom?
A. It has no double bottom.
Q. This was for the purpose of showing this cell is
119 still alive since 1938, it will function and give light?
A. Right.
Q. What was the purpose of making up this cell, Plaintiff's Exhibit No. 13?
A. To answer theoretical questions as to what would happen if the reinforcement was left off.
Q. What is the nature of the mix in here as compared with your commercial product?
A. I believe it is the same. I can answer that definitely; it is the same.
Q. What caused that bottom to bulge?
A. Pressure developed inside the cell.
Q. Will you tell me how much that pressure is?
A. No, not in pounds.
Q. Can you give an estimate of what it reaches in the interior?
A. Not a good estimate.
Q. Better than fifty or seventy-five pounds?
The Court: Per square inch?
A. I should say that would be reasonable.
Q. It would take considerable pressure to bulge that bottom?
A. Right.
Q. Is your commercial cell hermetically sealed?
A. It depends on the definition of hermetically sealed.
Q. What do you understand it to mean?
A. I think the product is hermetically sealed if there is absolutely no venting possible; that is, it would be absolutely gas tight, for example.
120 Q. Do you recommend leaving your Leak Proof cells in flashlights after they are exhausted?
A. No.
Q. When do you think they should be taken out?
A. That is up to the individual; we can't control it.
Q. You mean it isn't safe to leave them in the casing for an indefinite period?
A. Not indefinitely.

Q. What happens after they have been there six months?

A. In many cases nothing happens.

Q. What happens if a cell is shorted and left in the case for an indefinite period for—say six or eight months?

A. It would depend on the age of the cell and the nature of the short.

Q. Is your commercial cell slightly smaller than the alleged infringing cell—I mean in diameter?

A. I haven't checked that point. I believe they are approximately the same diameter.

Q. I have here two cells, made by General, and ask you to put these here and to state whether or not the Ray-O-Vac cell is smaller than the other two?

A. If this pencil is straight, the Ray-O-Vac is smaller in diameter.

Q. Can't you tell by the eye whether that is true?

A. Yes, sir.

Q. Your Ray-O-Vac cell is slightly smaller than the General cell?

A. Yes, sir.

121 Mr. Schroeder: Is that the Leak Proof?

Mr. Chilton: Yes, both are Leak Proof.

Q. Mr. Ramsey, all of your Ray-O-Vac cells include a drawn zinc cup in your commercial products?

A. That particular cell—size cell?

Q. The Leak Proof?

A. Right.

Q. They all include the double bottom?

A. That is correct.

Q. Do you know what type of cup is used by the General Dry Battery in their cells?

A. I believe the extruded cup is in general use.

Q. Would you recognize that as an extruded or drawn cup?

A. This would be an extruded can.

Q. Can you state about the relative thickness of the bottom and side walls of the cup?

A. There is considerable variation; I could not answer that unless I measured it.

Q. The bottom is of substantially greater thickness than the sides?

A. That is usually the case.

Q. In the drawn zinc cup, are not the bottom and the side walls substantially the same?

A. That is correct.

Q. Did you state why this cell bulged at the bottom, Plaintiff's Exhibit No. 13?

A. Because of internal pressure.

Q. Did that cell bulge that way without being shorted? Plaintiff's Exhibit No. 13?

122 A. Yes, that is—

Q. It has never been shorted; it has been on the shelf?

A. It was not in service to my knowledge.

Q. How old is it?

A. This will have to be an estimate; I should say about eight or nine months.

Q. It has been on the shelf in your place; you built and constructed it?

A. Not personally.

Q. Under your supervision?

A. Yes, sir.

Q. The mix is the same as the standard mix?

A. Yes, sir.

Q. How do you account for this Exhibit No. 18 bulging at the bottom?

A. That is an entirely different mix, Mr. Chilton, and it is a different construction also. There is a reinforcing washer of some thickness, approximately an eighth of an inch. The cells are not comparable physically at all, Mr. Chilton.

Q. Do you not use an insulating disc or washer at the bottom of the cup?

A. We use a washer at the bottom of the cup.

Q. Does that washer render inactive the bottom of the can?

A. No.

Q. What does it do?

A. It prevents the physical contact between the
123 carbon electrode and the zinc can at the time the mix is put in; otherwise, the carbon electrode would be driven through the depolarizer.

Q. Does the electrolyte have solution contact with the bottom of the cup?

A. With a large portion.

Q. Through the insulating disc?

A. Not through, but below or on the sides of it.

Q. It soaks through?

A. The bottom is acted on partially.

Q. With an extruded zinc can, such as I show you—you know that process, do you not?

A. I am not sure I do.

Q. Is it not possible to extrude the cup and leave the bottom any desired thickness?

A. Up to a certain extent, yes, sir.

Q. You know, do you not, that the extruded zinc cans are made from slugs like this?

A. Yes, sir.

Q. And dies form it into a cup?

A. Yes.

Q. You may have the bottom thickness regulated if you desire?

A. Within certain limitations. It is difficult to get the bottom as thin as you want it.

Q. Why?

A. Conservation of zinc.

Q. It is a little difficult to get it now, I presume.

A. Yes, sir.

124 Mr. Chilton: That is all.

Mr. Schroeder: No further examination.

The Court: No examination.

Witness excused.

Mr. Schroeder: In accordance with our stipulation, I would like to read into the record, Rule 42 of the Rules of Practice of the United States Patent Office, revised, 1940.

Mr. Chilton: I have no objection to your doing so, but I don't believe it is in the stipulation.

Mr. Schroeder: We offer the Rule.

The Court: It may be received in evidence.

Which said Rule No. 42, of the Rules of Practice of the United States Patent Office, revised, 1940, is in words and figures following, to-wit:

125 "If several inventions claimed in a single application be of such a nature that a single patent may not be issued to cover them, the inventor will be required to limit the description, drawing, and claim of the pending application to whichever invention he may elect * * *".

126 CLEM CLARDY, a witness called on behalf of the Plaintiff herein, being first duly sworn on his oath, upon examination-in-chief by Mr. Bernard A. Schroeder, deposed and testified as follows:

Mr. Schroeder:

Q. You may state your full name?

A. Clem Clardy.

Q. What is your age?

A. Forty-three.

Q. Where do you reside?

A. Madison, Wisconsin.

Q. What is your occupation?

A. Assistant to the President of the Ray-O-Vac Company.

Q. How long have you been with the Company?

A. Seventeen years.

Q. Do you have anything to do with the Government contracts that are taken by the Ray-O-Vac Company?

A. I am the contact man with the Signal Corps and also handle contacts in Washington in the procurement of materials.

Q. Have you had anything to do with matters of priority?

A. I have, yes, sir.

Q. Have there been any problems of getting materials to go into these dry cells?

A. Yes, there has been, of course, on all types of material used, such as steel and zinc.

Q. Can you tell us approximately how many cells were used by the Signal Corps of the United States Army
127 from June, 1940 to July, 1941?

A. What type?

Q. Leak Proof cells.

A. Twenty-one million.

Q. For one fiscal year?

The Court: For the year ending this July?

A. This July, twenty-one million.

The Court: Their contract reads twenty-one million?

Q. I said from June, 1940 to July 1st, 1941?

A. It was about nine million in 1940.

Q. Can you give us the estimated figure for the year from July, 1941 to July 1st, 1942—for the rest of this month?

A. That is twenty-one million. That is this year.

Mr. Chilton: The actual production or what?

A. Actual production.

Mr. Chilton: Of your product?

A. Our product. We were awarded a total contract on B. A. Thirties, which is specified.

Q. I hand you a letter, dated February 23, 1942, signed by Mr. E. Baird Smith of the Bureau of Industrial Conservation. Can you tell us, briefly, what the letter is about?

A. Well, the Simplification Branch of the Bureau of Industrial Conservation in Washington are interested in the simplification of types of material which go into war needs. This deals with that. They wanted everyone to use the same size zinc can so that it would be simplified in the manufacture. This was asking for our cooperation along that line but we went to the Signal Corps with
128 this request and they did not want to make any changes in the size of the cell.

Q. The signal corps did not want to make any change?

A. They did not.

Q. That letter was referred to you as Contact man in that Company?

A. Yes, sir.

Mr. Schroeder: I would like to offer a photostatic copy of that letter, dated February 23, 1942.

Mr. Chilton: To which there is no objection.

The Court: It may be received in evidence.

Which said Plaintiff's Exhibit No. 19, so marked for identification, is in words and figures following, to-wit:

129 PLAINTIFF'S EXHIBIT NO. 19.

WAR PRODUCTION BOARD
Washington, D. C.

February 23, 1942.

Mr. Ralph A. Ramsay,
Ray-O-Vac Company,
Madison, Wisconsin.

Dear Mr. Ramsay:

The opportunity of discussing the simplified list of dry batteries was very much appreciated, and I have every hope that we can carry this program to a successful conclusion.

My understanding is that you folks out in Madison will consider your suggestions of a simplified list that will fulfill the needs of both of government and consumer needs. In the event that government specifications make it difficult to incorporate these as a part of the general program at this time or that changes in their specifications indicate an unnecessarily long delay in competing the project, we will proceed with the consumer simplification program as an independent project and go forward with government work later.

At this time we are particularly interested in the simplification of two types of dry batteries; i. e., flashlight cells and hearing aid device batteries. In connection with the hearing aid device batteries, any simplifications project must assume that the variations in terminals specified by individual manufacturers will be eliminated. Our ob-
130 jective will be, therefore, the shortest list of batteries that can fulfill the present needs of deaf people owning these devices.

Again many thanks for your courtesies, and I look forward to hearing from you at the earliest possible date.

Sincerely yours,
(Signed) E. Baird Smith,
E. Baird Smith,
*Simplification Branch, Bureau of Industrial Conservation.*

131 Q. You say you took this matter up with the United States Signal Corps' officers?

A. Yes, sir. The Chief Officer for Procurement is located in Chicago.

Q. What is the name of the Commanding officer?

A. Colonel Clark.

Q. Did he write a letter to your Company, dated February 26, 1942, referring to the letter which you have just identified and which we have just offered in evidence as Plaintiff's Exhibit No. 19?

A. He did.

Q. Is this a photostatic copy of that letter? I have the original here from Colonel Clark to the Ray-O-Vac Company?

A. It is.

Mr. Schroeder: I might say to your Honor that Counsel for Defendants very kindly consented to let us offer this letter in evidence, without causing Colonel Clark to

appear here in person and testify. We did not want to interfere with his war activities.

Mr. Schroeder: Plaintiff at this time offers the photostatic copy of the letter from Colonel Clark as Plaintiff's Exhibit No. 20.

The Court: It may be received in evidence.

Which said Plaintiff's Exhibit No. 20, is in words and figures following, to-wit:

132 PLAINTIFF'S EXHIBIT NO. 20

UNITED STATES ARMY.

Chicago Signal Corps Procurement District.
1819 West Pershing Road,
Chicago, Illinois.

In Reply Refer To
413.4 (Batteries)

February 26, 1942.

Ray-O-Vac Company,
Madison, Wisconsin.

Gentlemen:

Reference is made to letter of February 23, 1942, from the War Production Board, Washington, D. C., signed by Mr. E. Baird Smith, Simplification Branch. It is noted therein that there was an intimation that all dry batteries could be standardized. This can not be with reference to the requirements of the U. S. Army.

The U. S. Army requires a leak proof cell and none other for the following reason: Ten cents worth of batteries will destroy a $150 switchboard in just about twenty-four hours, which makes it evident that there is no conservation in this but mere destruction at the battle front, where the loss of communications due to leaking batteries can be least endured.

Very truly yours,
(Signed) Thomas L. Clark,
*Lt. Colonel, Signal Corps.,*
*Officer in Charge.*

133 Q. I hand you two letters, dated April 4, 1942, addressed to Ray-O-Vac Company, Madison, Wisconsin, signed by J. S. Knowlson, Director of Industrial Operation, and ask you to tell us what these letters are?

A. Well, these letters are giving us materials—I mean tin plate and steel over the Order L-71 which was issued, and restricted the use of steel and tin plate in the manufacture of batteries.

Q. At the time Colonel Clark gave you the letter offered in evidence as Plaintiff's Exhibit No. 20, did he give you anything else?

A. He gave me these batteries.

Q. What was done with these batteries?

A. He gave me these batteries and he told me these batteries had come from tests which had been run by the Signal Corps and I could take them to Washington and use them as an illustration of what happens to these instruments used by the Signal Corps. I have a competitive battery, also bought by the Signal Corps—

Mr. Chilton: To which Defendants object as being hearsay.

Mr. Schroeder: I am willing to strike the latter part of the answer.

The Court: The testimony as to what was said to him will be stricken as being hearsay.

Q. State what you did with the cells you received?

134 A. I took them down to Washington and showed them to the Conservation and Simplification Departments down there, which resulted in our securing permission to use steel and tin plate in the manufacture of Leak Proof cells.

Mr. Schroeder: Plaintiff offers this box of cells as PLAINTIFF'S EXHIBIT NO. 21.

Mr. Chilton: What is the purpose of the offer?

Mr. Schroeder: To demonstrate what happens to a cell when it swells and expands. We are not offering them to show what happened in the Signal Corps.

The Court: There is one of these that is your product.

A. They are all submitted to the same test.

The Court: None of the Defendants' cells are in here.

A. That was a cell submitted to the Signal Corps for test, which later came up in the purchase of batteries for the Signal Corps.

The Court: The exhibit may be received in evidence.

Q. As a result of your conferences in Washington, did you receive the letters you previously referred to?

A. Yes, sir, giving us tonnage.

The Court: The letters speak for themselves.

Mr. Schroeder: I would like to offer these letters as PLAINTIFF'S EXHIBITS NOS. 22 and 23 and I would like to ask leave to withdraw the originals and substitute photostatic copies.

The Court: The exhibits may be received in evidence and you may have leave to substitute photostatic copies.

135 Which said Plaintiff's Exhibits Nos. 22 and 23, so marked for identification, are in words and figures, following, to-wit:

136 PLAINTIFF'S EXHIBIT NO. 22.

WAR PRODUCTION BOARD.

Washington, D. C.

April 4, 1942.

CC G.A.S.

In Reply Refer To:
3:E:66
Tin plate for L P
Tops—8.56
Bottoms—5.00
13.56

Rav-O-Vac Company,
Madison, Wisconsin.

Gentlemen:

This is with reference to your application for relief under Section h of Order L-71. The basis of your appeal is stated to be that compliance with that Order would work an exceptional or unreasonable hardship upon you.

After careful consideration of the facts relied upon in your appeal, which you have furnished, the following relief from Order L-71 is hereby authorized.

You are permitted to use a maximum of 41 tons of tinplate in the production of Leakproof Cells for other than A-2 or higher rated orders for a maximum period of sixty days ending May 30, 1942.

The provisions of Section (b) (1) contained in Order L-71 are waived to the extent required to obtain the relief authorized above, provided that this Section and all other Sections of Order L-71 and all other Orders and Regula-

tions of the War Production Board are fully complied with.

Very truly yours,
(Signed) J. S. Knowlson,
J. S. Knowlson,
*Director of Industry Operations.*

Domestic needs for April & May, 1942—5,000,000.
Gross use tin plate steel tops and Bottoms per M.—13.56.
Total lbs.—67,800 or 33.9 tons. Can use 41 tons.

137 PLAINTIFF'S EXHIBIT NO. 23.

WAR PRODUCTION BOARD,
Washington, D. C.

April 4, 1942.

C. C.: G.A.S.

In reply Refer To:
3:E:66.

Ray-O-Vac Company,
Madison, Wisconsin.

Gentlemen:

This is with reference to your application for relief under Section h of Order L-71. The basis of your appeal is stated to be that compliance with that Order would work an exceptional or unreasonable hardship upon you.

After careful consideration of the facts relied upon in your appeal, which you have furnished, the following relief from Order L-71 is hereby authorized:

You are permitted to use 41 tons of steel per month in addition to that permitted under L-71 in the production of dry batteries during April, May and June, 1942.

The provisions of Section (b) (4) contained in Order L-71 are waived to the extent required to obtain the relief authorized above, provided that this Section and all other Sections of Order L-71 and all other Orders and Regulations of the War Production Board are fully complied with.

Very truly yours,
(Signed) J. S. Knowlson,
J. S. Knowlson,
*Director of Industry Operations.*

138 Q. Do you know what use the Signal Corps makes of Ray-O-Vac Leak Proof cells?

A. They use them in communication lines—telegraph and telephone lines, flashlight and aeroplanes.

Q. Do you know of any other cell that meets are requirements of the Signal Corps, other than Ray-O-Vac?

A. No other cell meets that requirement.

Q. Have you had any complaints or return of Ray-O-Vac Leak Proof cells from the Signal Corps?

A. I have never had a complaint or a return from the Signal Corps.

Mr. Sshroeder: That is all.

*Cross-Examination.*

And the witness, on cross-examination by Mr. W. E. Chilton, deposed and testified further as follows:

Mr. Chilton:

Q. Do you have any information as to what the requirements of the Signal Corps are? Do you have the written specifications?

A. Yes. We have in our files.

Q. They have written specifications?

A. Yes, sir.

Q. You say no other Company was able to meet those specifications?

A. Yes, sir. I am advised by the Signal Corps there is not.

139 Q. Do you know whether the General Dry Battery has been approved?

A. I do not. The last time I heard, they had not.

Mr. Chilton: That is all.

Mr. Schroeder: No further examination.

Witness excused.

140 HERMAN R. C. ANTHONY, a witness called on behalf of Plaintiff herein, being first duly sworn on his oath, upon examination-in-chief by Mr. B. A. Schroeder, deposed and testified as follows:

Mr. Schroeder:

Q. You may state your name.

A. Herman R. C. Anthony.

Q. What is your age?

A. Forty-five.
Q. Where do you reside?
A. Frostwood Road, Madison, Wisconsin.
Q. What was your college training?
A. Mechanical Engineer, University of Wisconsin, Bachelor of Science degree, 1924.
Q. What is your occupation?
A. Development Engineer, Ray-O-Vac Company.
Q. When did you start work with the Ray-O-Vac Company?
A. I started steadily with them in June, 1924.
Q. Are you the inventor of the patent in suit, No. 2,198,423?
A. I am.
Q. Have you done any other work during the past fifteen years other than with Ray-O-Vac Company?
A. I did some free lance consulting work of my own.
Q. Consulting Engineer?
A. Yes, sir.
Q. And can you tell us what other countries you have received patents on the same invention, described in the Anthony Patent in suit?
141 A. I received patents from Argentina, Australia, Brazil, Canada, Chile, Mexico, Venezuela, and I have made application to Cuba.
Q. Were you refused a patent in any of those countries where application was made?
A. No, sir.
Q. When was the improved cell first put on sale, commercially?
A. In 1939, somewhere around June.
Q. Have you examined the books of the Company to determine how many cells have been sold from that time—that is—the total number of unit sales in the last ten years?
A. Yes, sir.
Q. Leak Proof cells. Have you prepared a table of sales and a chart, showing the cells and sales for a period of about ten years, of Leak Proof cells, and also of its predecessors?
A. Yes, sir, I have prepared a chart.
Q. How many Leak Proof cells were sold in 1939 by your Company?
A. In 1939, there were 733,018 Leak Proof cells sold by Ray-O-Vac.
Q. And the following year?

A. 12,629,678.

Q. The year 1941?

A. 33,362,293.

Q. You have the figures for the first four months of 1942?

A. Yes, sir, through April 1942. 23,636,773.

142 Q. What was the retail price of Leak Proof cells in the first year, 1939?

A. Two for a quarter.

Q. When was the price reduced?

A. In January, 1940, it was reduced to ten cents straight retail.

Mr. Schroeder: I would like to offer this chart in evidence as PLAINTIFF'S EXHIBIT NO. 24.

The Court: The exhibit may be received.

Q. Will you explain what is meant by the notations on this curve: "Wax-Top", "Metal-Top Introduced" and "Leak-Proof Introduced"?

A. By the notation "Wax-Top Introduced" there between 1936 and 1937, means prior.

Mr. Chilton: You mean metal top?

A. Yes, I say, metal top was introduced in 1937 and 1937, which means prior to that time we were making wax top cells. It was in that period that the metal top was introduced, and in 1939, the Leak Proof cell was introduced.

Q. As I understand, the metal top gradually replaced the wax top and the Leak Proof replaced the metal top?

A. Yes, sir, that gradually happened.

Mr. Schroeder: We have a stipulation as to an unbiased estimate of the number or total number of flashlight cells sold from 1932 to 1941. These figures appeared in the Electrical Merchandise magazine and are the only fig-
143 ures of the kind available. We would like to introduce those figures and the chart, showing the sales throughout the industry varied throughout this period.

Mr. Chilton: It is perfectly all right except that we do not admit the correctness of the figures. We admit it is an unbiased estimate.

The Court: The chart may be received in evidence.

Q. I hand you another chart and these figures in the first column, 1932, Flashlight Sales of the Entire Industry for ten years. Were those taken from the Electrical Merchandise magazine?

A. Yes, sir, they were.

Q. In the second column, "Total sold by Ray-O-Vac, including Leak Proof". Tell where those figures were secured?

A. Those figures were obtained from the permanent records of the Company that are used as reference to the sales.

Q. The Ray-O-Vac Company?

A. Yes, the Ray-O-Vac Company.

Q. In the third column we have "Total, including Leak Proof". Where were those figures obtained?

A. Those figures were obtained from the same source of information.

Q. Will you explain the difference in those figures? Why one is larger than the other?

A. The first column indicated as the total sold by Ray-O-Vac, as the Number Two Unit cell, including Leak Proof, means we segregated every number Two size or D-size cell sold as a unit cell, whether sold under the Ray-O-Vac 144 label or under special label; it was segregated to that size.

Q. This chart you have plotted, the horizontal line here for the years, 1932 to 1941, and the vertical, the percentage of total flashlight cells sold in the entire industry—the vertical figures represent the position of the Ray-O-Vac Company in the industry?

A. Yes, sir. The curves or points for each year show the percentage that Ray-O-Vac was selling, as compared with the entire industry; therefore, the curve shows the relative position over a period of years.

Mr. Schroeder: Plaintiff offers that chart in evidence as PLAINTIFF'S EXHIBIT NO. 25.

The Court: The exhibit may be received in evidence.

Q. Have you made an investigation of the permanent records of the Company to determine the total expenditures in dollars for advertising by Ray-O-Vac Company for the years 1925 through 1941?

A. Yes, sir, I have.

Q. These figures on the chart I hand you, were those figures compiled by you from those records?

A. Yes, sir.

Q. This chart, will you explain the graph?

Mr. Chilton: Is that all the advertising for all products?

A. This is the Trade paper and magazine advertising for all products.

145 Mr. Chilton: Not necessarily for Ray-O-Vac cells?

A. No. The base line shows the years; the vertical line the dollars; and the plotted line shows the expenditure over that period of 1924 to 1941.

Mr. Schroeder: Plaintiff offers in evidence this chart as PLAINTIFF'S EXHIBIT NO. 26.

The Court: It may be received in evidence.

Q. Referring now to the commercial Ray-O-Vac Leak Proof cell, we note the metal plate on the bottom.

A. Yes, sir.

Q. Will you tell us the original purpose of that plate?

A. The original purpose of that plate was, we were going to start out to merchandise this cell at a higher price than ordinary, and in order to be extra safe and sure that no leak would get past, I insisted that an extra plate be placed on there temporarily.

Q. Later on, when you reduced the price of the cell from two for a quarter to ten cents each, was the question of the metal plate again considered?

A. Yes, sir.

Q. And what was decided?

A. Well, it is economy, together with the fact that it gives an added reinforcement and additional assurance against any possibility of leakage, and the bright surface eliminated cleaning the bottom of the zinc can, and also gives what we call, identity to the cell, and it is more economical to leave it on than to take it off.

146 Q. Identify this dry cell?

A. Yes, that is a sample that I had made up to illustrate and explain to you when I asked you to make application for the patent.

Q. Is that the form used in making the drawing of Figure Eight of the patent in suit?

A. Yes, sir, that is the form.

Q. Was there any means provided for venting that cell?

A. No, no means provided.

Q. Where has that cell been since the time it was submitted?

A. As far as I know, it has been in your possession. I left it there at the time.

Q. You just saw it again a few days ago?

A. Right.

Mr. Schroeder: Plaintiff offers this in evidence as PLAINTIFF'S EXHIBIT NO. 27.

The Court: It may be received in evidence.

Mr. Schroeder: You may cross-examine.

*Cross-Examination.*

And the witness, on cross-examination by Mr. W. E. Chilton, deposed and testified further as follows:

Mr. Chilton:

Q. Did you submit any other samples along with this one when the application was prepared?

A. Yes, I did.

Q. Have you been able to locate those?

A. Mr. Schroeder, are there any other samples?

Mr. Schroeder: Yes, sir. (Samples submitted by Counsel.)

147 Q. This box of samples which Counsel just handed to me, can you tell me what they are?

A. They are, likewise, samples given Mr. Schroeder to illustrate the invention.

Q. It is typical of Figure One of your patent?

A. Yes, sir, I would say it closely resembled the drawing.

Mr. Schroeder: I didn't get your answer.

A. They would resemble not the drawing, probably, but the basis of the drawing.

Q. Identify this as an exhibit.

Mr. Schroeder: As I understand, this is a dummy. I don't think there is anything inside of it. I am not sure.

The Court: You may have the Reporter mark it as an exhibit.

Mr. Schroeder: As Defendant's Exhibit?

Q. Do you have a copy of the patent in suit, No. 2,198,423? Referring to particularly, Figure One of that Patent. What is the material of which the composition Twenty is formed?

A. The insulating disc?

Q. From what material is it formed?

A. It might be of any material.

Q. For example?

A. The most logical material that would come to mind would be fibre or bak-o-lite or strong, stiff cardboard.

Q. In that cell, in Fig. One, there is no metal closure extending entirely across the top of the cell, is there?

A. In that figure, no.

148 Q. There is a metal cap, however, over the carbon electrode?

A. Yes, sir.

Q. In that respect, it is different from your commercial cell, Exhibit No. 14?

A. Yes, sir.

Q. I hand you a cut-out cell, identified as Plaintiff's commercial cell, Defendants' Exhibit No. 6, and ask you to compare that cell with Figure One, the patent in suit, with particular respect to the metal washed on the hood?

A. What do you mean—at the top?

Q. At the top of the cell.

A. In Figure One, the picture shows a metal cap over the carbon pencil and an insulating washer surrounding that.

Q. And that insulating washer is gripped between the upper end of the zinc can and the turned edge of the metal sleeve, is it not?

A. Yes, sir.

Q. On the peripherial edge?

A. Yes, sir, the picture looks that way.

Q. How does it compare with your cell, identified as Exhibit No. 13?

A. In Exhibit No. 13, the metal covering goes clear across the top of the cell.

Q. And that cap or carbon button has a vent?

A. In the drawing, it shows a vent.

149 The Court: What is the number of the cap, 19?

Q. 19. "• • • the upper end of the carbon pole B is provided with a flanged cap which snugly fits into an aperture provided in an insulating disc which forms an end closure for the cell". What is the purpose of that vent, 21?

A. I really don't know. It just happened to be put in there.

Q. Could it be possible its purpose was to allow gas to escape?

A. It is possible that gas could escape through it.

Q. The specifications further state that "A perforation 21 in the end cap permits venting of gas through the carbon terminal". Do you agree with that statement?

A. Yes, sir.

Q. What can you say in respect to whether the electrolyte would escape through that vent opening?

A. I believe it would be possible if the vent so carried it up if it got around the carbon to the opening.

Q. The carbon pencil is porous?

A. Some of them are.

Q. Have you had occasion to see any cell in which the electrolyte escaped through the electrode and through the vent opening in the cap?

A. I have seen a few individual cells where a crack in the cap, the electrolyte would go through.

Q. What is the consistency of electrolyte in your commercial cell when it is put in? In regard to its flowability?

150 A. When it is introduced into the zinc can?

Q. Yes, sir.

A. It is a light weight cream.

Q. It is a flowable mixture?

A. Yes, sir.

Q. Referring now to Figure 11 of this patent, and I believe someone testified this morning that the electrode is a hollow, cylindrical shell?

A. Yes, sir.

Q. The electrode is forty-one, shown in Figure Thirteen, is a fragmentary view; now that forty-three is folded around number Twenty-two, is it not?

Mr. Schroeder: I don't want to interrupt but the patent speaks for itself and it is not a matter covered in direct examination. However, if it is any aid to the Court—

The Court: I don't think it is cross-examination.

Mr. Chilton: Mr. Anthony was called for a deposition in Chicago and we went through part of this and I have that deposition. If you won't permit me to ask him, I would like to call him for cross-examination and—

The Court: I think it properly comes in your case.

Mr. Chilton: We will drop it for a moment. I will drop the matter and conclude my cross-examination.

*Redirect Examination.*

And the witness, on redirect examination by Mr.
151 B. A. Schroeder, deposed and testified further as follows:

Mr. Schroeder:

Q. Mr. Anthony, referring to this Plaintiff's Exhibit No. 27, have you tested that cell within the last day or so to see whether there is any life in it?

A. No.

Q. You didn't see anyone operate it?

A. No, sir.

Q. Would you say this cell was a dummy—nothing in it?

A. I don't really remember. It is light. There is nothing in it.

Mr. Schroeder: I would like to offer in evidence as PLAINTIFF'S EXHIBIT NO. 28; the Goodyear Leak Proof cell it is charged to infringe. It is agreed that was sold in Kankakee and made by the General Dry Batteries.

The Court: It may be received in evidence.

Mr. Schroeder: Exhibit No. 29 is a General Protex Double Duty cell.

Mr. Chilton: To which there is no objection.

The Court: The exhibit may be received in evidence.

Mr. Schroeder: I would like to offer as PLAINTIFF'S EXHIBIT NO. 30 a sample of the Protex cell and we have sections cut out of the cell to show the interior construction.

The Court: It may be received in evidence.

Mr. Schroeder: Plaintiff rests.

And the Defendants, to sustain the issues in their behalf, introduced the following testimony, that is to say:

152 Mr. Chilton: If the Court please, I should like to proceed with the cross-examination of Mr. Anthony.

The Court: You mean the examination of Mr. Anthony as an adverse witness.

Mr. Chilton: He gave a deposition in Chicago—

The Court: Let us not cover the same ground twice.

Mr. Schroeder: I don't believe Mr. Anthony is qualified as a hostile witness. If Counsel for Defendants calls him, it would have to be direct examination.

The Court: I suppose the nature of the questions will determine whether it is direct examination and the attitude of the witness will be largely a question for the Court to determine.

Mr. Chilton: I call him now for cross-examination.

The Court: Don't make the expression of cross-examination. You are calling him for examination in-chief, as a hostile witness.

Mr. Chilton: Very well.

HERMAN R. C. ANTHONY, having been previously sworn on his oath, upon being called by Defendants for examination-in-chief as a hostile witness, deposed and testified further as follows:

153 Mr. Chilton:

Q. Mr. Anthony, when I released you from the stand, we were discussing this cell with the cell disclosed by the patent in suit. Is this a fair sample of it—a partial cell? You have Plaintiff's Exhibit No. 13. In your commercial cell, which is identified as Plaintiff's Exhibit No. 14, you have an asphalt seal between this and the top of the cell?

A. Yes, sir.

Q. You have a metal cover over the top of the carbon button which is secured to, but insulated from, the zinc container?

A. Yes, sir.

Q. You omit in the commercial construction, the washer of the patent in suit, indicated by Reference Twenty, in Figure One. Did you get the question?

Read the Question.

Question, as read: You omit in the commercial construction, the washer of the patent in suit, indicated by Reference Twenty, in Figure One?

A. Yes, sir.

Q. Now, referring over to Figure Eleven, I started to ask you this morning as to the consistency of the electrolyte in that cell?

A. I answered that.

Q. Will you repeat it, please?

A. About a light weight cream.

Q. It is a flowable mixture?

154 A. Yes, sir.

Q. In Figure Eleven, there appears to be disclosed at the top of the carbon cap, a vent hole, which has no reference, connection or likewise to Numeral Fifty. Will

you state if that is the same as appears in Twenty-one, in Figure One?

Mr. Wiles: I think the patent will speak for itself. The witness can neither add nor substract.

Mr. Chilton: There is a hole shown there but not described. I am asking this witness to state if it is the same.

The Court: You may ask him if there is a vent.

Q. Do you agree there is a vent there?

A. A cross-hatch under the cap, appearing twice, although there is no vent.

Q. In Figure Eleven, the zinc electrode is formed of a hollow cylindrical member, is it not?

A. Yes, sir.

Q. That is indicated by reference character forty-one?

A. Yes, sir.

Q. That has a tab, Forty-three, at the bottom?

A. Yes, sir.

Q. And that Tab, Forty-three, is rolled about the bottom of Twenty-two of the cell proper. You see at the right hand corner of Figure One is a tab, forty-three, shown in elevation.

A. Will you repeat the question?

Q. That tab is rolled about the peripherial or bottom wall of the cell, is it?

155 A. As near as I can make out, yes.

Q. Forty-two makes the bottom of the cell, is that correct?

A. Yes, sir.

Q. Would that hollow cylindrical metal electrode, Forty-one, hold any electrolyte if it had no bottom in it or before the bottom was attached to it?

A. Obviously, no.

Q. Mr. Chilton: If the Court please, we took some depositions in Chicago. It is stipulated that this cell, identified in the deposition as A-4, was in public use and on sale for more than two years prior to that in the patent in suit.

Q. Mr. Anthony, I will show you that battery. You are familiar with that, I believe?

Mr. Wiles: To which the Plaintiff objects. Are you familiar with it?

A. I have seen it from the exterior.

Q. You have examined such a battery in your plant?

A. Not in minute detail; the general construction of it.

Q. Have you made any tests whatever on that?

A. I do not make tests.

Q. Will you state whether or not that battery, comprising four cells, within a single metal case—a metal sheath—

A. I can see two cells and knowing the general construction of lanterns—lantern batteries, it would have four cells in order to have six volts, as printed on the label.

Q. Can you see that each individual cell is wrapped in an individual sleeve?

A. The ones that are shown are.

156 Q. That metal sleeve is crimped around the top and bottom of the container, proper?

A. Crimped around the top and bottom to the end piece.

Q. Each cell is individually sealed at the top? I think the Court has a model that is open all the way?

A. Yes, sir.

The Court: You may use this if you wish.

Q. I think this will be sufficient. Were you familiar with this cell at the time you filed your patent application?

Mr. Wiles: To which the Plaintiff objects.

The Court: What is your objection.

Mr. Wiles: It can't make any difference whether he knew it or didn't, if it was in use. It has a legal effect.

The Court: He is bound to know it.

Mr. Chilton: He is presumed to know it.

The Court: He is bound to know it. Every man who makes a patent, has to take notice of all prior art.

Mr. Chilton: He is presumed to know it.

The Court: He may answer.

Mr. Chilton: Read the question.

Question, as read: Were you familiar with this cell at the time you filed your patent application?

A. Yes, sir, I knew of that battery.

Q. Had you seen the inside of it?

A. I think so. I can't say for certain.

Q. I hand you now a battery identified as Defendants' Exhibit No. 7 and ask you if you are familiar with this cell—this battery?

A. Not necessarily familiar with that particular
157 battery, but I am familiar with that type of construction.

Q. The Hot Shot batteries?

A. Right.

Q. This was on the market long before your patent application was filed?

A. Yes, sir.

Q. That comprises a metal top and bottom, containing two or more cells?

A. Yes, sir.

Q. Rolled together about the peripheral edge. You were familiar with this battery when you filed your application?

A. Yes, sir.

Q. In order that I may not have to repeat, I would like to look at this deposition. What is the purpose, Mr. Anthony, of that asphalt washer at the top of your commercial cell?

A. There isn't any asphalt washer at the top of the commercial cell.

Q. At the top of the mix; isn't that a washer there? Do you show this in—would this show it more clearly?

A. There is a layer of asphalt there.

Q. What is the purpose of that?

A. As a sealing.

Q. For what? What is its function?

A. Well it acts and helps to seal off the cell, as sealing wax would.

Q. You never made, commercially, the cell shown in 158 either Figure One or Figure Eleven of the patent in suit, did you?

A. Not that I recall.

Q. And Ray-O-Vac never marketed the B-Two cell that did not have a double bottom wall, did they?

A. I don't believe so.

Mr. Chilton: I should like to read a question from the deposition of Mr. Anthony.

Mr. Wiles: To which we object.

The Court: Are you offering the deposition?

Mr. Wiles: I understand that you can't use depositions when the witness is on the stand. There is no occasion to use his deposition.

The Court: I am not sure about that.

Mr. Chilton: I am not going over the same ground in this testimony.

Mr. Wiles: This is one of these discovery depositions and it is my understanding that you can't, under the Rules, use it unless the witness is more than a hundred miles away from the place of trial.

The Court: He desires to read a question or two from the deposition. He may do so, subject to your objection.

Q. Mr. Anthony, this question was asked you by way

of deposition, taken in Chicago on April 16, 1942: Question: Referring now to your former patent No. 2,198,423, will you state which figure or what drawings of that patent mostly clearly discloses your present Leak Proof cell?

159 Mr. Schroeder: The question is objected to as calling for an interpretation of the patent, which is a matter of law and must be left for the Court to decide.

Mr. Chilton: Question: I would merely like you, Mr. Anthony, to point out which figure of your earlier patent more closely approximates your present Leak Proof Cell.

Mr. Schroeder: Same objection.

Answer: I would rather not answer that unless it is necessary.

Q. I now ask you if you will answer that question?

Mr. Schroeder: We renew our objection on the same ground.

The Court: He may answer, subject to objection.

Q. You understand the question?

A. I think so. I don't think any drawings are in exact accordance with the commercial construction used today.

Q. Which of Figures One and Eleven more closely approximates your commercial construction?

Mr. Wiles: To which we object; the patent speaks for itself.

The Court: The objection is sustained.

Mr. Chilton: He is the patentee; he should know.

The Court: He can't change the patent. He can't change the device. The patent must speak for itself.

Q. In Figure Eleven, Mr. Anthony, the specifications state "In the modification shown in Figs. 11-13, a zinc cup is not used but the cell is built up within a tubular 160 steel casing in the following manner.

A. What paragraph?

Q. I am reading from Page Two, beginning at line forty. I am asking you whether or not there would be any tendency for the electrolyte to escape around the brass cap of the carbon button in that modification? Around the peripheral portion—around the brass cap?

A. About through here?

Q. About the edge of that brass cap.

A. I believe that is going to be dependent upon the thickness of the sheet between the insulating washer and the carbon cap.

Q. Did you build any cells according to that disclosure of Fig. Eleven, experimentally or otherwise?

A. There might have been one or two, experimentally. I don't definitely recall one.

Q. Do you recall whether you noted any leakage at that point?

A. No, sir.

Q. That is one of your Ray-O-Vac products purchased on the open market. I think you will agree that is your product?

A. Yes, sir.

Mr. Chilton: That is all.

*Cross-Examination.*

And the witness, on cross-examination by Mr. B. A. Schroeder, deposed and testified further as follows:

Mr. Schroeder:

Q. Mr. Anthony, I understand these exhibits were offered with your deposition.

161 Mr. Chilton: The depositions were sent here by the Notary, I understand.

Mr. Schroeder: They are offered in evidence?

The Court: What?

Mr. Schroeder: I don't know.

Mr. Chilton: I offer the deposition.

The Court: He said there was a stipulation that that exhibit was in public use for more than two years prior to that application, and he identified it as Exhibit A-4.

Mr. Schroeder: It has not been offered.

Mr. Chilton: I offer the exhibit in evidence at this time as A-4.

The Court: It may be received in evidence.

Q. Mr. Anthony, referring now to Defendants' Exhibit A-4, can you state from your examination of that battery whether it is capable of withstanding any internal pressure?

A. If there is any internal pressure inside of it, there are two large holes for it to come out of.

Q. Where are those holes located?

A. One is at the center of the one end and the other is toward the corner of the same end.

Q. Is there any room provided in that battery for the cells to swell?

A. Well, there is certainly room here where they can swell.

Q. Assuming that one of those cells in that con-
162 tainer leaked, is there anything to prevent that from damaging another cell in the same container?

A. If one cell leaks through the paper jacket and got to either electrode of the adjacent cell.

Q. And contact was thus formed between the side walls and the two cells, would that damage either of the cells? Would it cause a short circuit or loss of current?

A. Yes, sir, with the circuit that is generally employed in this battery, it would short one cell.

Q. Now, referring to this Hot Shot battery, six volts, what is your understanding of the purpose of this metal container that confines these six cells?

A. I always assume it was put on as a weather proofing covering and a covering to take abuse, where it is used on the ignition on gasoline motor boats, etc.

Q. Is there any provision made there to prevent the individual cells from swelling?

A. There is no apparent provision.

Q. Do you know whether any attempt was made to have that container hermetically sealed?

A. I don't know about this one but in making our own, we never intended to.

Mr. Schroeder: That is all.

*Redirect Examination.*

And the witness, on redirect examination by Mr. Wm. E. Chilton, deposed and testified further as follows:

Mr. Chilton:

Q. Are you familiar with the type of lantern this 163 battery, Defendants' Exhibit A-4, was used with? I hand you this lantern and ask you if that is the type of lantern that battery is used with?

A. That is the general type.

Q. Mr. Chilton: I would like to show the Court this. The battery sets up in there and makes a circuit, and so on. That fits within a closed container, does it not?

A. Yes, sir.

Q. Each one of the individual cells of this battery, Defendants' Exhibit A-4, is wrapped in a sleeve, duplicate sleeve, as far as you can tell?

A. As far as I can see.

Q. If the electrolyte should leak from one of the cells, would it not be retained within that casing?

A. I can't answer that. I don't know of that particular case.

Q. Mr. Chilton: I would like to offer in evidence the deposition of Mr. A. M. Rock, taken at Cleveland on May 21, 1942.

The Court: The deposition may be received in evidence.

Which said deposition is in words and figures following, to-wit:

164 *Recross Examination.*

And the witness, on recross examination by Mr. B. A. Schroeder, deposed and testified further as follows:

Mr. Schroeder:

Q. This lantern that was shown to you, I believe it is not offered in evidence?

Mr. Chilton: I didn't offer it.

Q. It is understood that this lantern is used either in the position of resting on the wire base, or inverted. That is the way to demonstrate it, with the bulb at the top. Do you know which is the normal way of using this lantern in railroad work?

A. No, I really don't.

Q. Can you tell or do you know whether it is intended to be invertible?

A. Looking at it, there is only one assumption. It can be set on either end.

Q. If it is standing on the wire base, the battery would be inverted—the terminals would be down?

A. Yes, sir.

Q. If there was any leakage within this container, where would it go?

A. If there was any leakage, it is logical for it to come out of the hole and leak down into the lantern.

Mr. Schroeder: That is all.

Mr. Chilton: No further examination.

Witness excused.

165 CHARLES G. BIRDSALL, a witness called on behalf of Defendants herein, being first duly sworn on his oath, upon examination in chief by Mr. Wm. E. Chilton, deposed and testified as follows:

Mr. Chilton:

Q. Please state your name?

A. Charles G. Birdsall.

Q. With what Company are you associated?

A. General Dry Batteries, Inc.

Q. How long have you been with that Company?

A. Since September, 1937.

Q. And what are your duties?

A. I have charge of the laboratory of the Company and the various plants owned by the Company.

Q. Are you in the laboratory?

A. Yes, sir.

Q. Do your duties include making tests of dry cells?

A. They do.

Q. With what Company were you prior to your being with General?

A. I was with the Bright Star Battery Company of Clifton, New Jersey.

Q. For what period of time?

A. From 1930 to September, 1937.

Q. What were your duties with that Company?

A. The same as they are with General Dry Batteries: in charge of their laboratory, control testing and testing of batteries.

166 Q. I hand you a dry cell, identified as Defendants' Exhibit No. 8 and ask you if you can identify it?

A. That is a battery made by the Bright Star Battery Company.

Q. Were you with Bright Star when that cell was developed?

A. Yes, sir, I was.

Q. Did you make any tests on that cell while it was being developed?

A. Yes, sir.

Q. With what Company were you prior to being with Bright Star?

A. The National Carbon Company.

Q. How many years were you with the National Carbon Company?

A. Six or seven years.

Q. What were your duties with the National Carbon Company?

A. They were mainly plant development and control work.

Q. Including the testing of dry cells?

A. Yes, it did.

Q. How many years of experience have you had in the testing of dry cells?

A. Twenty-two years.

Q. Will you give us, briefly, an outline of your education?

A. I studied Chemical Engineering at the University of Illinois; graduated from there with a Bachelor of Science degree in February, 1920.

Q. Did you have any other schooling?

A. The first two years of college were at Columbia University, New York City.

167 Q. This cell, Defendants' Exhibit No. 8,—you have a sample of it there. Do you know under which patent that cell was made?

A. Well, it is the Peter Corigliono patent. The number is usually on this covering. On this particular one, it doesn't show.

Q. There is another Bright Star. Do you know the number of that patent?

A. The number is, 2,000,510.

Q. Do you know what patent that is?

A. The inventor is Peter Corigliono.

Q. Mr. Chilton: If the Court please, I would like to offer DEFENDANTS' EXHIBIT NO. 10 in evidence a folder of patents on which we are relying, to show the prior state of the art. Our opponents have copies of all the references. We are relying on thirteen patents, altogether:

The Court: What are the numbers?

Mr. Chilton: 570,591: 720,592: 1,188,408: 1,299,813: 1,611,153: 1,654,823: 1,991,132: 2,000,510: 2,060,832: and the British patent, 38,663.

Mr. Schroeder: What about the Cheney patent?

Mr. Chilton: I am not going to offer it. This a copy for the Court.

The Court: Thank you.

Q. Will you now refer to the Peter Corigliono patent, May 7, 1935. You can take this book if you can hold it.

Patent No. 2,000,510. Is that the patent under which the Bright Star battery is made—Defendants Exhibit No. 8?

A. Yes, it is.

168 Q. Will you explain to the Court the construction of that particular cell?

A. You are referring particularly to the top?

Q. To the top.

A. The outer covering of this top is a metal cap. Directly underneath that is a celluloid cover with a slightly longer skirt or flange cover and around the the carbon electrode the celluloid extends up around the brass cap slightly. The brass cap on top—

The Court: You say there is celluloid?

A. Yes, it is a celluloid disc. You can see the edge of it extending along this metal; it is transparent.

The Court: It is right on top?

Q. What is the purpose of that celluloid cap?

A. The purpose of that celluloid cap is to insulate the metal enclosure from both the carbon electrode and the zinc can.

Q. Is that a drawn can or an extruded can?

A. It is a drawn can.

Q. Are you familiar with the patent, 2,000,510, to which I just referred?

A. Yes, sir, I am.

Q. State whether or not that cell is made substantially in accordance with the teachings of that patent?

A. I would say it was made exactly.

Q. Did you state that the cover of the cell you have in your hand is insulated from the zinc cup?

A. Yes, sir.

Q. It has a wrapper on the outside?

169 A. The cell has a paper wrapper, yes, sir.

Q. Will you now explain to the Court just how an extruded zinc cup is formed, such as used in General's construction?

A. This metal slug—like this—is warmed to perhaps four hundred degrees, Farenheit, to facilitate the extrusion operation. This slug is dropped into a die and a punch is forced into the die, making a can like this in substantially one operation. The only other step is to trim it to this particular length.

Q. This can is one extruded from a slug?

A. Yes, sir.

Q. What is the thickness of the bottom of the can as compared with the side walls?

A. Our specifications call for the bottom to be twenty to twenty-two thousandths, and the side walls, fourteen to fifteen thousandths.

Q. Can you regulate the thickness of the bottom wall fairly accurately?

A. Yes, we can.

Q. So that you can have a cup with a bottom wall any thickness you desire?

A. Yes, sir.

Q. Does that explain why you do not have to have a double bottom on your can?

A. With a heavy zinc wall, the strength is in the integral part of the can, so that reinforcement is not necessary.

170 Q. How does the size of the cell, Bright Star, compare with the alleged infringing cell?

A. You mean in—

Q. In diameter?

A. In diameter. Well, I would say it was slightly larger.

Q. It has a rather thick cover on it, does it not?

A. The paper jacket is rather heavy, yes, sir.

Q. How does that compare, in thickness, with the General cell—the Protex cell? How does it compare in thickness with the Protex cell, the wrapper, I should say?

A. Well, the total thickness of the metal jacket and its inner lining is the same, approximately the same, as this single paper jacket on this cell.

Q. I will show you this cell, identified as Defendants' Exhibit No. 11, and ask you to tell us what that is?

A. That is a Bright Star cell from which its regular jacket, outside jacket, has been removed, and there has been inserted one of our metal jackets and the top and bottom crimped over.

Q. Will you demonstrate how this is done—how you did that with the pieces I give you here, so that the Court will see what you are doing?

A. We remove this Bright Star cell from the jacket and insert in the paper sleeve inside of the jacket, and then merely turn over the tops and bottoms of the can of the sleeve.

Mr. Chilton: Your Honor, here is another chart which

demonstrates what was done there. In reading the
171 chart, the complete outer—the cell with the metal
cover, such as we have here, the metal cover is slipped
over it and spun over here. That is a Bright Star cell
with a General shell around it and an insulating sleeve.

Q. I hand you now Defendants' Exhibit No. 9 and ask you to explain that to the Court, or have you done that already?

A. No. This is a flashlight cell made by National Carbon Company.

Q. Known as the Eveready?

A. The Eveready No. Nine Fifty flashlight cell.

Q. Do you know what patent that was made under?

A. It was made under the Smith patent.

Q. No. 2,060,832?

A. Yes, sir, that is the patent.

Q. That is disclosed at the left on the big chart?

A. Yes, sir, on the bottom row, figure three.

Q. Will you explain the construction of that cell which you hold in your hands?

A. It has a metal cover, which is very tightly clamped over the edge of the zinc can, with a carbon electrode. The electrode is covered with a brass cap, having a flange and an insulating disc of paper on which the inner edge of the metal cover rests.

Q. That cell has an outer wrapper on it, too?

A. Yes, sir, it has a paper jacket on it.

Q. You have there one of the metal sleeves off of the Protex cell. Will you remove that sleeve and put it on
the Eveready cells? That is demonstrated on the right
172 of the small chart, in red. I think your Honor will
see that he slipped off the wrapper and put it on here and this exhibit, identified as Defendants' Exhibit No. 12, shows the cell after the casing has been bent over both edges, just as was done with the Bright Star cell.

Q. I hand you a cut-out cell, showing Defendants' Protex cell, Defendants' Exhibit No. 13, and ask you to explain that construction to the Court.

A. In this construction—

The Court: What is that? What product?

A. This cell, the top of the zinc electrode is turned in slightly to make the top diameter smaller than the diameter of the rest of the can.

Q. That is shown here?

A. On top of that is placed a rubber washer; on top of the rubber washer is a metal cap, having a place for the carbon electrode to be inserted. Then that is slipped into a metal jacket, having an insulating paper sleeve which extends—the insulated paper sleeve is somewhat longer than the metal outer sleeve, and extends beyond the outer edge and as they are turned over, that holds the cover on tightly to the top of the cell.

Q. The metal cover is insulated from the zinc electrode, is it not?

A. Yes, sir. The metal cover is a positive electrode in the cell and is insulated from the zinc can.

173 Q. And the metal shell—the exterior—is insulated from the cup?

A. The metal sleeve is insulated from both the positive and negative electrodes.

Q. What is the purpose of the small chamber left at the top?

A. That is an air space or expansion chamber and that—and into which the excess liquid developed during the discharge of the cell, under heavy usage, collects.

Q. Have you tested many of these cells like General, Protex?

A. Yes, sir, I have.

Q. I hand you a cut out of a dry cell, identified as Defendants' Exhibit No. 14, and ask you to state what that is?

A. This is our old style wax top.

Q. Is that shown at the left lower column of that chart?

A. Yes, sir, that is right.

Q. What is that cell? Is that a predecessor of your present Leak Proof cell?

A. Yes, it is.

Q. Will you point out the features of construction of that cell?

A. Well, just above the mix, that irregular line indicates a corrugated washer, which is on top of the active material in the cell, and acts as a small expansion chamber for gases or liquids from the cell when it is discharged, and above that is the wax seal. The turned in edges and corners are what we have called our curled rim construction. The zinc can is turned over on top so that
174 when the seal is poured into the cell and pressure applied to the top, the space is completely filled with

seal, making a very seal-tight construction, much more so than if the zinc walls were straight up.

Q. Will you explain to the Court how this problem of making leak proof cells, particularly flashlight cells, first arose in your Company? I will withdraw that question.

Q. How long ago was this construction you have just described as Defendants Exhibit No. 14, been made by your Company?

A. Well, it has been made as long as I have been connected with the Company.

Q. Was it made in 1930?

A. I couldn't answer that. It was made prior to 1937. I started with them in 1937.

Mr. Chilton: Will the Reporter read the previous question, please?

Question, as read: Will you explain to the Court how this problem of making leak proof cells, particularly flashlight cells, first arose in your Company?

A. Of course, there has always been the problem of having cells exude electrolyte during discharge under rather abusive conditions, or conditions of heavy discharge, and we make batteries for a large number of different Companies under their own label.

Q. Who first suggested to your Company, if you know, the making of an improvement in flashlight cells to prevent leakage?

A. Mr. Forrester, of Montgomery-Wards, suggested 175 to us that we do some development work of making a cell which would be substantially more leak proof than any cells we had been making for them prior to that time.

Q. What did you do following that?

A. Well, we did a considerable amount of work in the laboratory, trying various constructions, different methods, of confining the natural leakage of the cell within the paper jacket, or within the container surrounding the cell; changes in the formula or mix used; different methods of top construction, other than wax, and various different ideas that pointed toward helping to solve that problem.

And it finally developed into the present accused cell shown on the right of the chart?

A. Right.

Mr. Chilton: I would like to identify this chart so that we can refer to it, as Defendants' Exhibit No. 15, and the

smaller chart, which I handed to the Court is Defendants' Exhibit No. 15.

Q. Will you now, Mr. Birdsall, compare the accused cell with the one of the patent in suit, and point out the essential differences in construction? The main differences. That is the second patent disclosed at the extreme right of the chart, Defendants' Exhibit No. 15. The patent is Figure Eleven as disclosed here.

A. Well, the chief differences, at the top, in the accused cell, there is a metal cover where the top of the cell
176 and in Figure Eleven, the main part of the top of the cell is covered with an insulating washer, resting on the cap of the carbon electrode. The other difference, of course, is that of the bottom; in the accused cell, the bottom is just the bottom of the cell; the zinc can in Figure Eleven, the bottom is apparently an extra piece of metal which has been clamped to the side walls of the zinc can.

Q. There is no double wall between in Figure Eleven?

A. Apparently not. There is a depression there and an insulated piece of paper, I believe, and the seal is poured in that depression to make the bottom level on the inside.

Q. Now, will you refer to this construction and compare that with the disclosure of Figure One of the patent in suit. Point out where it departs from that disclosure. I will hand you my copy of Figure One of the patent in suit so that you may do that.

A. Figure One of the Anthony patent 2,198,423, shows an insulating washer, Number Twenty, across the top of the cell, resting on a flange of the cap of the carbon electrode. The cap is Number Nineteen, and the outer wall of the metallic shell is crimped over the cell, over the insulating washer, and in the present construction, it appears that the space above the active mix has been filled with an asphalt sealing compound and a metal cover is used instead of the insulating cover in Figure One.

177 Q. Would you say the commercial construction departs from the teaching of the patent?

Mr. Wiles: I think he can point out the differences but I think the expression "departs from the teaching of the patent" is not proper.

The Court: I think so.

Mr. Chilton: This witness is qualified.

The Court: Yes, but even as an expert, he is not going

to tell me how to read the patent. The Court is going to do without any help from the experts or anybody else.

Q. Would you explain about the double bottom wall in the construction of the commercial Ray-O-Vac cell?

A. This commercial cell has an extra metallic bottom, placed beneath the zinc can.

Q. Which does not appear in the patent in suit?

A. In Figure One there is no indication that there is an extra metallic bottom.

Q. Is there any extra metallic bottom shown in Figure Eleven?

A. The Court: You asked him that once. He said there was no double bottom.

Q. I will drop that. Going back to Defendants' Exhibit No. V-4-F, the lantern battery, explain the construction of that battery? You have no doubt tested that battery?

A. Yes, sir, I have.

Q. Explain, briefly, its construction.

178 A. Well, in constructing this battery, first, the heavy cardboard bottom has a metal jacket crimped over it; then an asphalt sealing compound is poured over that to make a thick layer, perhaps a sixteenth of an inch thick; then the four insulating tubes are placed in the container and the four cells placed in the paper sleeves. The paper sleeves are made of special asphalt filled paper, making them water proof and more or less electrolyte proof. The inside of the—

Q. The cell is put in while the seal is soft or hot?

A. The cells are put in while the seal—before it has cooled; it is still in the molten state. When the cells are placed in the jackets, the metal jacket, itself, is lined with a heavy asphalt filled paper. The cells, after being inserted in the jackets, are connected electrically, to make it—it is connected to the cells in series, to make it six volts; the terminals are attached; the top of the four cells are sealed with sealing compound. The zinc can of these cells has been turned over, curled in, the same as in the second cell of that chart.

Q. Defendants old construction?

A. Right, so that the seal is locked under the edge of the zinc can. Then the top piece of the heavy piece of cardboard is placed over the cells and the top clamped over.

Q. Do you have any complaint in regard to that battery leaking?

A. To my knowledge, there has never been any.

Q. You would know of it?

A. Yes, sir, the laboratory inspects and analyzes returned products from complaining customers.

179 Q. Referring in there to Defendants' Exhibit No. 7, the Hot Shot battery, will you explain briefly what the utility of that battery is?

A. How?

Q. Explain its utility?

A. Well, it is a six volt battery, used to operate ignition systems, on small gasoline motors, on farm equipment and sometimes on small motors for operation of boats; operation of electrical fences and innumerable uses.

Q. I had in mind particularly the metal shell and top and bottom cover. Of what are they formed?

A. Yes, sir. The bottom is formed of metal and so is the top.

Q. They are clamped together?

A. They are locked together.

Q. Is that liquid tight, would you say?

A. Well, substantially so.

Q. Isn't it a fact that some of the cells are actually leak proof?

A. Yes, sir. Practically no construction could make cells that would be one hundred percent leak proof.

Q. Have you tested any Ray-O-Vac commercial cells, placed in flashlight cases and operated? I hand you two such cells and ask you to state what you know about those cells and the results of the test.

A. These are two cells which have been discharged in flashlight cases in the laboratory to a point where no
180 useful light would be given off by the case. One cell shows—

Q. Will you unwrap that, please.

A. This cell shows some exudation of material near the bottom disc, near the outer periphery of the bottom disc of the cell.

Q. What would cause that?

A. That would probably be electrolyte from the inside of the cell.

Q. You have tested enough cells to know what that would be.

What is its chemical mix?

A. It is originally zinc chloride.

Q. Does that have a corrosive effect?

A. Yes, it does.

Q. Unwrap the other cell which you have in your hand.

A. This is another cell in which just a slight change was made and a small hole made in the brass cap.

Q. Is this one of the commercial cells of Ray-O-Vac with a hole punched in the cap?

A. Yes, sir.

Q. State what the result of the test was on that cell?

A. That cell shows slight leakage through the hole in the metal covering over the brass cap.

Q. How long did you operate those cells in a flashlight?

A. This leakage was apparent within forty-eight hours after the cells were placed in the flashlight case and the switch turned on.

Mr. Chilton: I think we better put these in evidence. There will be DEFENDANTS' EXHIBITS NOS. 17 and 18.

184 The Court: The exhibits may be received.

Q. You referred a while ago to spirally wound tubing. Will you demonstrate the construction of that? Could you use a match to show how that comes apart?

A. Yes, I could. The tubing used is made of paper which is two plys of paper stuck together with asphalt.

Q. Spirally wound?

A. Yes, sir, spirally wound.

Q. That is the casing you used over the accused cell?

A. Yes, sir.

Q. What can you say in regard to how leak proof that particular type of tubing is?

A. It is as leak proof as any commercial paper product that we can obtain at this time.

The Court: It is like roofing paper that I put on my garage—tar paper?

Mr. Chilton: It is on the inside.

The Court: You have two layers and they are stuck together?

A. Right.

Q. I will ask you to explain this small chart. Can you see it from here? Will you explain this chart, identified as Plaintiff's Exhibit No. 16?

A. I have explained that.

Q. You have a copy of the second Anthony patent, have you?

A. No.

Q. Explain that.

A. The Court: Let me inquire if there are any other witnesses to be sworn in this morning?

Mr. Chilton: I have one more.

182 Q. Will you refer to the second Anthony patent, Plaintiff's Exhibit No. 8?

The Court: That is not the patent in suit?

Mr. Schroeder: It is patent No. 2,243,938.

Mr. Chilton: It is in evidence.

Mr. Schroeder: Plaintiff's Exhibit No. 8.

Q. Will you explain wherein Figure One of that patent departs from the disclosure of Figure One of the patent in suit? Do you understand the question?

A. You mean Figure Eleven?

Q. Figure Eleven of the 1938 patent as compared with Figure One.

A. In Figure One from this patent, it appears that a metal cover is used for the top of the cell from the disclosure described in Figure One, the top of the zinc can. In Figure One, it shows the top of the zinc can in Number Eleven has been slightly turned inward and on it rests an insulating washer, Number Ten. The metal cover at the top of the cell rests on that and the carbon electrode and the paper jacket and outer metal sleeve are turned over that metal cover.

Q. I had in mind particularly in regard to the metal cover and the vent in the first—

A. I believe that is the way the patent discloses it.

Q. The older patent shows the vent, and the inverted cover in the latter?

A. There is no number indicating there is any vent in that cover.

Mr. Chilton: Here is a sample of the Ray-O-Vac 183 cell which shows that on the wrapper.

Mr. Chilton: Defendants offer in evidence the folder containing the file references of the two Anthony patents and file wrappers.

Mr. Schroeder: To which we object; we put in the file wrappers and the contents.

Mr. Chilton: This is the folder.

The Court: It may be received in evidence.

Mr. Chilton: That is all.

*Cross-Examination.*

And the witness, on cross-examination by Mr. B. A. Schroeder, deposed and testified further as follows:

Mr. Schroeder:

Q. In referring to Defendants' Exhibit No. 9, to this Eveready battery, I understood you to say this was made under the Smith patent?

A. Yes, sir.

Q. How do you arrive at that conclusion?

A. Well, from examination of this cell and comparing it with Figure Three of the Smith patent, as shown on that chart.

Q. There is no patent number on that particular exhibit 9, is there?

A. No, there is no patent number shown on the label.

Q. You understand that a patentee is required to give notice of his patent, to put on patent numbers. Is that the practice of Eveready?

184 A. From my experience with Eveready, it wasn't their practice to show it on the individual wrapper or labels of the articles, but a slip or piece of cardboard, disclosing in large numbers, all groups of patents under which cells are supposed to be made, are placed in each shipping carton of several hundred cells.

Q. This particular Smith patent you refer to, that patent is directed to a kind of valve which releases the gas pressure?

A. Yes, sir, that is right.

Q. Do you know whether that feature is present in the particular cell offered in evidence?

A. From examination of the cell, it would appear that it was. I was with the National Carbon Company when this cell was developed and from examination and the appearance, I would say it was substantially the same at the top closure as it was when I was with them.

Q. Did you know they subsequently decided to seal that up by putting sealing wax underneath, sealing off the valve, so there would be no leakage?

A. To my knowledge, that has been done in the industrial type of Eveready built for special purposes, used by utilities and all Government use, and not in this standard cell, sold in most hardware and dime store.

Q. A cell that gets very heavy usage, turned on a great

many minutes per day, they take special precaution to avoid leakage?

A. Yes, they do.

185 Q. Taking Exhibits Nos. 17 and 18, these two Ray-O-Vac cells you tested, how would you describe the test you gave them? I believe you testified you put them in a flashlight and left it on until the cells were dead?

A. Yes, they were put in this flashlight case. I had under test nine different cells.

The Court: You put them in and left them on until they were exhausted?

A. The flashlight case holds three cells and the switch was turned on at eight o'clock in the morning and the cells examined before five o'clock, our usual quitting time, and then examined the following morning, and around noon of the second day, they were on the test, we noticed the leakage which was as it now appears, on those cells.

Q. How many cells did you test?

A. Nine cells altogether.

Q. How many of them leaked?

A. Those two.

Q. Just that tiny drop you pointed out to the Court?

A. That is right.

Q. Did any of the cells swell in the case?

A. No, none of them did.

Q. Did you ever see a Ray-O-Vac Leak Proof cell swell? Have you seen it afterwards?

A. No, I haven't.

Mr. Schroeder: That is all.

186 *Redirect Examination.*

And the witness, on re-direct examination by Mr. Wm. E. Chilton, deposed and testified further as follows:

Mr. Chilton:

Q. How long does it ordinarily take for a cell to swell within the battery case?

A. With an ordinary paper jacket?

Q. First with an ordinary paper jacket, like the old construction—the curled rim type—the wax seal?

A. Well, it would depend partially on how heavy the drainage was, and the swelling would not take place until the zinc was consumed and until moisture could escape, causing the paper to swell. It would be a rather indefinite

period of time. It would be, perhaps, from a week to maybe three months after the cell had been discharged.

Q. But the paper wrapper has to become soaking wet?

A. Yes, sir.

Q. And the electrolyte has to leak through enough to make it wet enough to swell?

A. Yes, sir.

Q. And this paper you referred to a while ago, that is four layers in thickness, through?

A. Yes, sir, it is made—the paper used, this indicates—is two plys of paper with a layer of asphalt between them and another piece of paper, exactly like that, has been glued to the inside. There are four thicknesses of paper.

187 Q. And two thicknesses of asphalt?

A. Two thicknesses of asphalt to make up this paper tube.

Q. Did the old style paper covering, such as used in this Bright Star battery, leak through within that time?

A. On tearing this apart, there seems to be no evidence of any asphalt layers in here. I would say it would soak up rather rapidly.

Q. Someone asked you or Mr. Anthony about the V-4F leaking on being inverted, upside down. What has been your experience?

A. We use the same paper tubes as this on these cells with the two asphalt layers, and the tubes are not snugly fitted in the construction used in the battery. The tubes are sealed over—welded to the asphalt cell at the bottom and with a loose tube,—leakage does come through the side wall of one; there is considerable space where that electrolyte can be retained so that we have had practically no experience with ever having that leak out of the top of the battery when used inverted, or in that position.

Q. What you actually did when you made that cell was to take this metal sleeve off this type and put it on the new type cell?

Mr. Wiles: To which we object.

The Court: It is rather leading and suggestive.

Mr. Chilton: I will withdraw the question. That is all.

*Recross Examination.*

And the witness, on recross examination by Mr. B. A. Schroeder, deposed and testified further as follows:

188 Mr. Schroeder:

Q. I understand from your testimony on redirect that you feel the ordinary cardboard cover is strong enough to withhold the pressure of the zinc itself except when it gets wet?

A. Well, in my experience, I have never noticed much actual swelling of the zinc container. The main swelling of batteries I have seen sticking in cases, has been due to the swelling of the outer case—that is the paper tube on the battery.

Q. You have never seen the zinc, itself, swell?

A. I have never made any measurement but from observation, I would say there is very little swelling of the zinc itself; the zinc is all used up.

Q. I call your attention to Exhibit 21 offered, demonstrating the various cells. Here is the Eveready industrial cell. Would you say there is any swelling of the zinc?

A. The bottom of the can appears to have swollen. The sidewalls, without tearing it apart, I could not say whether if was due to wetting of the tubes or swelling.

Q. How about this tube?

A. The zinc did not swell; the mix was forced out of the top of the cell.

Q. It is your opinion that paper is strong enough to stop the zinc swelling if it doesn't get wet?

189 A. I don't see how you could have swelling of the zinc without getting the paper wet, if the zinc can has a rupture or break in it; when the zinc breaks—

Q. I call your attention to Plaintiff's Exhibit No. 13, a cell with enough internal pressure to blow the bottom of the zinc out. That is, to swell it out. There isn't any breakage there, as far as you can see. You think a paper shell would be able to withstand that kind of pressure?

A. No, I don't think it would.

Mr. Schroeder: That is all.

*Redirect Examination.*

And the witness, on redirect examination by Mr. Wm. E. Chilton, deposed and testified further as follows:

Mr. Chilton:

Q. There isn't any possibility or likelihood of a cell—a dry cell swelling within the flashlight within a twenty-four hour period, even though it is left on?

A. No, I don't think there would be?

Mr. Chilton: That is all.

Mr. Schroeder: No further cross-examination.

Witness excused.

190 CYRIL P. DIEBEL, a witness called on behalf of the Defendants herein, being first duly sworn on his oath, upon examination in chief by Mr. Wm. E. Chilton, deposed and testified as follows:

Mr. Chilton:

Q. Please state your name.

A. Cyril P. Diebel.

Q. You are an officer of the General Dry Batterys, Incorporated?

A. Yes, sir.

Q. What office do you hold?

A. President and Treasurer.

Q. How long have you been with that Company?

A. Over twenty years.

Q. Since it was formed?

A. Yes, sir.

Q. Are you in close touch with the development and research work going on from time to time?

A. Yes, I am.

Q. How many patents have you taken out?

A. More than twenty five in the United States and also foreign patents.

Q. Will you explain to the Court just how the problem of leakage in flashlight cells arose in your organization?

A. Well, leakage has been with us for a long time and it has always been our endeavor to curb it and, where it happens, to minimize its effects. In making some ninety per cent of the batteries for hearing aids used in this country the problem of leakage wasn't one of small con-

cern. It wasn't one of injuring the case; it was one
191 of injuring the human body. So, we were cognizant of the problem of leakage and adopted the construction that would resist leakage to the point of not damaging flashlight cases themselves. The thought was placed before us by Mr. Forrester of Montgomery Wards, mainly from a merchandising angle. We do not maintain our cell is leak proof; we maintain no cell is leak proof; that these constructions, both of the Plaintiff and ourselves, are helping but are not the entire solution to the problem. The replacing of flashlight cases is just good merchandising and Mr. Forrester, who is basically a merchandiser, advanced the thought to me on one of my trips out there, and he did a number of times in the course of conversations, and so we put as much time as we could spare, not only for flashlights but for hearing aids.

Q. Who is Mr. Forrester?

A. He is the buyer in the electrical department of Montgomery Wards, who bought batteries from us for use in flashlight cases.

Q. Will you explain how the hearing aid batteries are worn?

A. They are plugged in with a plug so that you can't connect them wrong. In the case of a man, they are slipped in the vest pocket. People who are hard of hearing are conscious of it and don't want anybody else to know it, so they try to hide it, and women almost always wear them under their clothing, and leakage there is a matter
192 of body burns, so it is in that work we have been rather conscious of the result of cells leaking.

Q. That problem was presented to you in the hearing aid field before the flashlight?

A. Yes, sir.

Q. Will you explain how you came to develop the battery identified here as Exhibit A-4?

A. Well, that battery is a direct adaptation of the work done in the hearing aid battery field. The sleeve, which is four layers of paper and two layers of asphalt, for all useful purposes, is resistant to the exuded liquid. As it is buried in the hot asphalt on the bottom. It had solved the problem practically a hundred percent in the hearing aid field and we, frankly, copied the lithographed steel case from the "Hot-Shot". Burgess was building a battery with a metal sleeve, substantially like this, except they only had an open separator, which wasn't designed for Leak

Proof construction. We adopted the hearing aid construction on every battery for both appearance and a better product. We don't deny that hearing aid batteries are more immune to damage by leakage. We are hoping to better the product and experience has proved that we did better it. Some thought was given to the use of metal on the flashlight cell, called size D, but the cost involved for a battery which, in our case, retailed for five cents, was prohibitive, so we rather threw it out because we never thought it commercially smart to add to the cost, but we have
193 worked constantly of confining the liquid of the dry battery—there is no such thing as a dry battery; they are only dry as compared with their predecessors; we tried to house them in so they would not cause damage if they were used hard or left on by mistake.

Q. What about the tendency of a dry cell, of the Leak Proof type, shown in the chart here, oozing or leaking electrolyte through the carbon button, if there is a vent?

A. Well, that is a matter of mechanics. If you have sufficient pressure, you have hydraulic pressure. We have hydraulic pressure in dry cells; there is carbon dioxide; we have measured them up to a hundred pounds to the square inch. If that chamber gets filled with cell gas, it is going to force the solution out right through the pores of the carbon; carbon is quite porous.

Q. Is it considered practical to hermetically seal a cell?

A. It is the dream we have all had but we have never found any way to have our pie and eat it. When you seal a cell you must permit a way of escape for the gas and also retain the liquid.

Q. What is the theory of the manner in which the excess pressure is relieved in the accused cell?

A. The edges of the steel sleeve are clamped inward and there is a rubber gasket above the upper edge of the zinc cup; in fact, the zinc is imbedded in. When the gas
194 pressure is severe enough—all metals stretch under pressure—they left enough to allow that to come through between the edge of the cup and the rubber. In our laboratory work, before we put it on the market, we ~~used cans with no vent and connected an air tube to it with~~ a control device, put it under water and set a braker over it, so we could relieve the gas pressure exactly as we wanted. We put on the maximum pressure to see if it would leak through. We got it so that it would leak gas

but not solution, except in very, very severe tests. We maintain we do not make leak proof cells.

Q. Are you familiar with the Smith patent?

A. Yes, sir. The theory back of this, which we don't dispute, is that the gas pressure is subjected to the area under that metal cap and, if sufficient to raise it, it acts as a flutter valve. It is the one on the right. When the gas presses up against this flange and gets sufficient, it raises that like a flutter valve. That is the theory back of it. We don't dispute it. Of course, if this carbon is a little porous, you get leakage there.

Q. Is carbon ever sufficiently porous to allow the electrolyte to leak through?

A. Carbons have to be made in quantities, to be able to sell a cell in the range in which they are sold and there is a certain amount of engineering in getting the density right. You can get it too dense and, in that case, when it is used in a cell, it will blow the top of the cell. That is one of the problems—to get that carbon so that it will leak under certain pressure.

Q. There was put in evidence here a National Carbon cell, with the wrapper and metal shell, as Exhibit No. 12, with the casing turned over. Can you state whether or not it will be a leak proof cell?

A. You almost have to re-define the testimony. There are two kinds of leakage; one is, if this chamber provided for the liquid squeezed by the expanding cell is not ample, it is going to leak around the top, like the one in the laboratory. That happens many times from overloads. The other leakage, which is a factor of time, is where the zinc used in a dry cell is entirely consumed, through use or abuse, there is nothing there to retain it, so that solution comes out and first hits that multiple water-proofed material and the inside of that tin sleeve, after it goes through the tube it hits the lacquer, so I should say this cell should prevent leakage out this way but not through the head.

Q. Was the problem of batteries sticking much of a concern?

A. It has been a bugaboo to pick up a flashlight and not have it work because the batteries were shot but to get new battery cells and not get the others out was the thing we were trying to correct, but that only happened in very, very few cases, such as where the case was thrown in with tools. It was quite a factor in the old days before many of the manufacturers knew as much as they do now about the

shelf life of batteries. Zinc chloride will pick up moisture and so cause swelling. We don't dispute the tendency
196 of exhausted cells to swell in a lateral direction.

Q. So far as the problems go, was this a serious one?

A. No, we often considered it good merchandising and cheaper for the consumer, to put out an insured flashlight cell.

Q. Were you concerned with the looks?

A. Yes. The use of metal presents a smooth, good looking article. We had experience with the old style where we could not sell many people, but when the steel sleeve came out, we have had lots of favorable comments on appearance, and the steel sleeve is an appearance feature.

Q. On the Protex cell, you guarantee to replace the cell. Have you had occasion to do that frequently?

A. We don't make flashlight cases; we are confined pretty much to the making of dry cells, but through our dealers, who handle cases of one make or another, we have replaced cases here and there for customers who have asked us for a credit memorandum.

Q. What has been your experience of people taking advantage of the guarantee?

A. Well, the consumer is always right. We are not arguing. It is much cheaper to give them a case and call it a day because there is a certain amount of good will involved there.

Q. How about hole-proof hosiery. I think it is true that very few people took advantage of that guarantee.

197 A. It is the old selling psychology. It is like a bullet proof vest; except the owner could not take one of those back. We don't claim that our cell is leak-proof.

Q. But you do claim that if it does leak, you will replace it?

A. Yes, sir.

Mr. Chilton: That is all.

Mr. Schroeder: No cross-examination.

Witness excused.

Mr. Chilton: If the Court please, at this time I wish to offer in evidence all the exhibits identified. I don't believe there is any objection.

The Court: I thought that had been done. However, all exhibits identified by either Plaintiff or Defendants may be considered in evidence.

Mr. Schroeder: May it be stipulated in the record that Plaintiff's Exhibit No. 21, offered and received in evidence, may be withdrawn and photographs used in place of the exhibit?

Mr. Chilton: It may be so stipulated.

Mr. Chilton: Defendants rest.

Mr. Schroeder: No rebuttal.

The Court: Parties hereto may exchange briefs within fifteen days from this date, and each party may have ten days thereafter in which to answer or reply, and with 198 the reply briefs, you may also file suggested findings of fact and conclusions of law and a proposed form of judgment. Such exhibits as either party may wish to withdraw, may be withdrawn. All other exhibits may be left with the Clerk.

And the foregoing are all the proceedings had upon the hearing in said cause.

199 State of Illinois, }
Vermilion County. } ss.

This Is to Certify, That the foregoing Report of the Proceedings of the Trial in said cause, is a full, true and complete report of said proceedings, as reported by the undersigned in shorthand, and from said original shorthand notes fully and correctly transcribed.

Dated at Danville, Illinois, this 13th day of June, A. D. 1942.

Gertrude [redacted]wney,
*Reporter.*

200 PLAINTIFF'S EXHIBIT 1.

Caution.

Do not leave flashlight batteries in flashlights after they are dead or after they ~~begin to show~~ signs of oozing.

Some batteries when rapidly discharged or when allowed to stand in flashlight a long period of time without use discharge and ooze a battery mixture which is very corrosive and which will ruin the switch and the inside of the case.

This acid substance is a good conductor of electricity and will short batteries if it throws across from the land support to the tube.

If cells have oozed in the flashlight and there is a wet, sticky, substance on the inside, this should be thoroughly washed out with hot water and thoroughly dried before fresh cells are inserted.

Do not leave dead batteries in the flashlight.

201 PLAINTIFF'S EXHIBIT 2.

Blaco.

Chrome plated tube
Prefocused for all distances
Beveled plate glass lens
New 3 position switch
Silver plated reflector
Genuine Mazda bulb
Shock absorber

To insert batteries remove lens ring and lamp assembly from forward end. Insert cells with brass caps up and replace head assembly.

Be sure to screw lens ring down tight.

In Caring for Your Flashlight

Before using, be sure bulb is firmly in place and tighten threaded parts. Don't leave switch in "on" position when light is not in use. Don't leave worn out cells in light or store away without removing cells. Failure to take these precautions results in ingredients discharging from the zinc can and destroying the mechanical efficiency of the light. Don't jar switch or handle roughly. Switch mechanism and bulb filaments are easily destroyed through misuse.

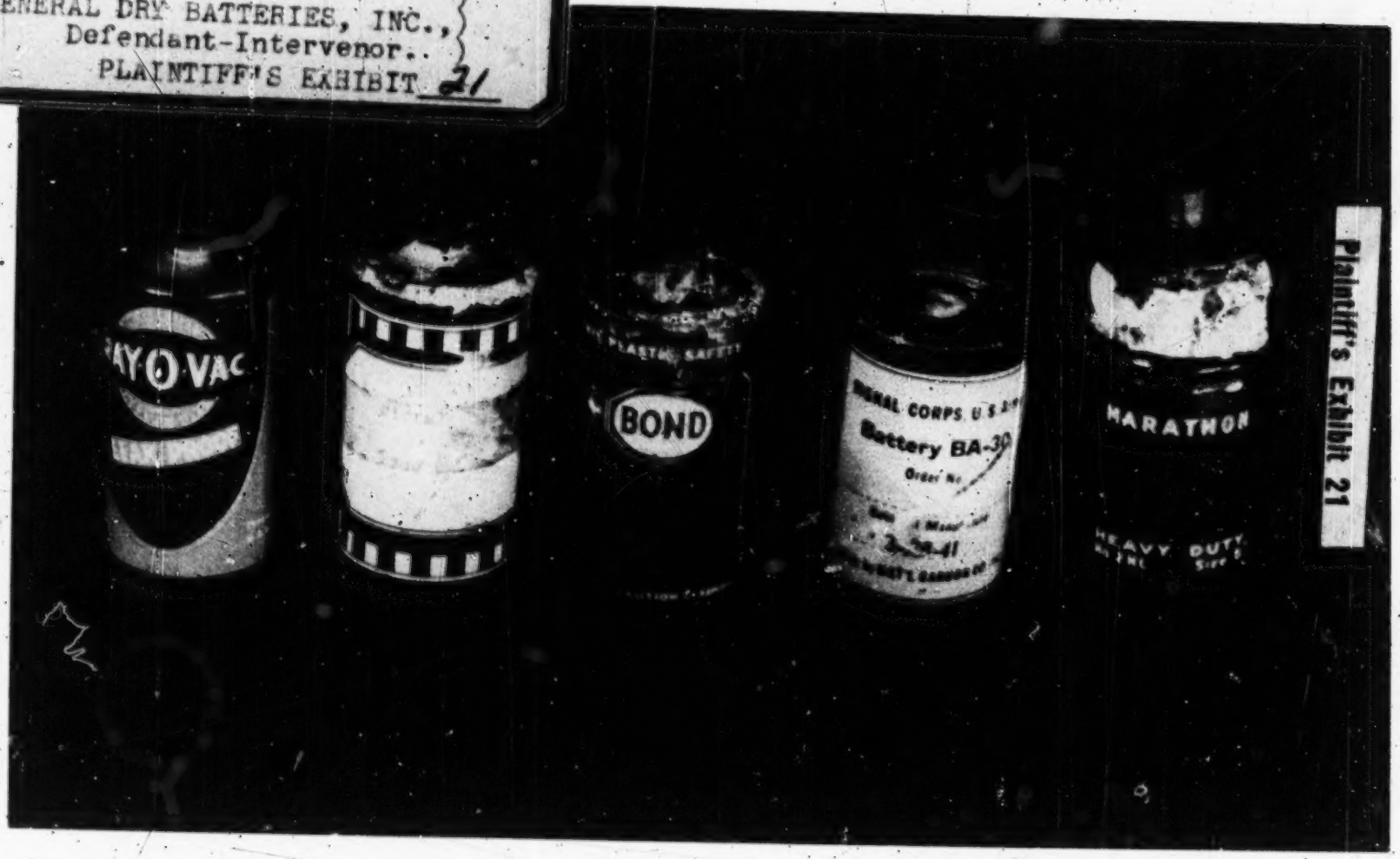
We will not replace or repair free of charge flashlights which have become inoperative because of oozing battery electrolyte.

IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF ILLINOIS

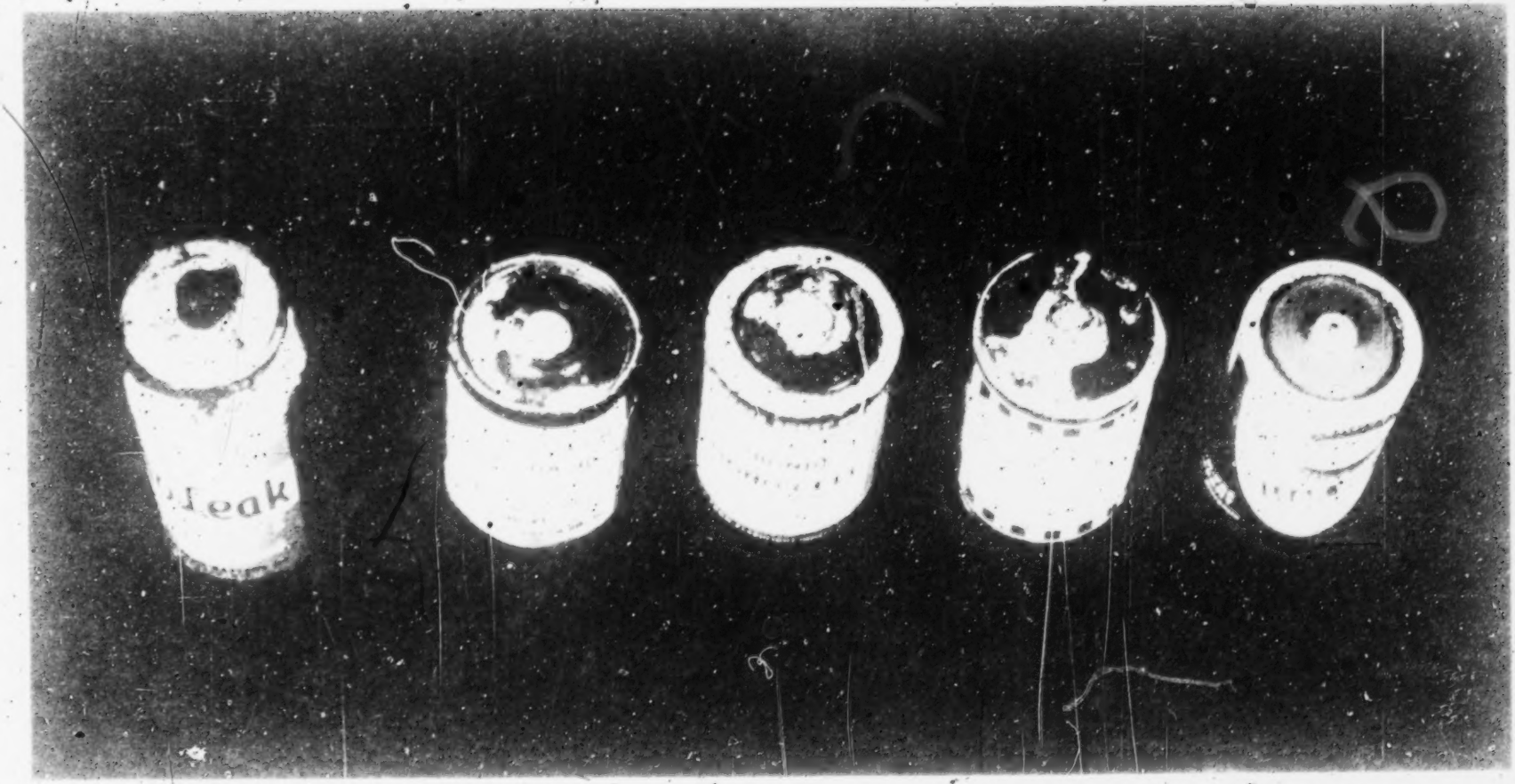
RAY-O-VAC COMPANY,
Plaintiff,
v.
THE GOODYEAR TIRE & RUBBER COMPANY, INC., Defendant,
and
GENERAL DRY BATTERIES, INC.,
Defendant-Intervenor.

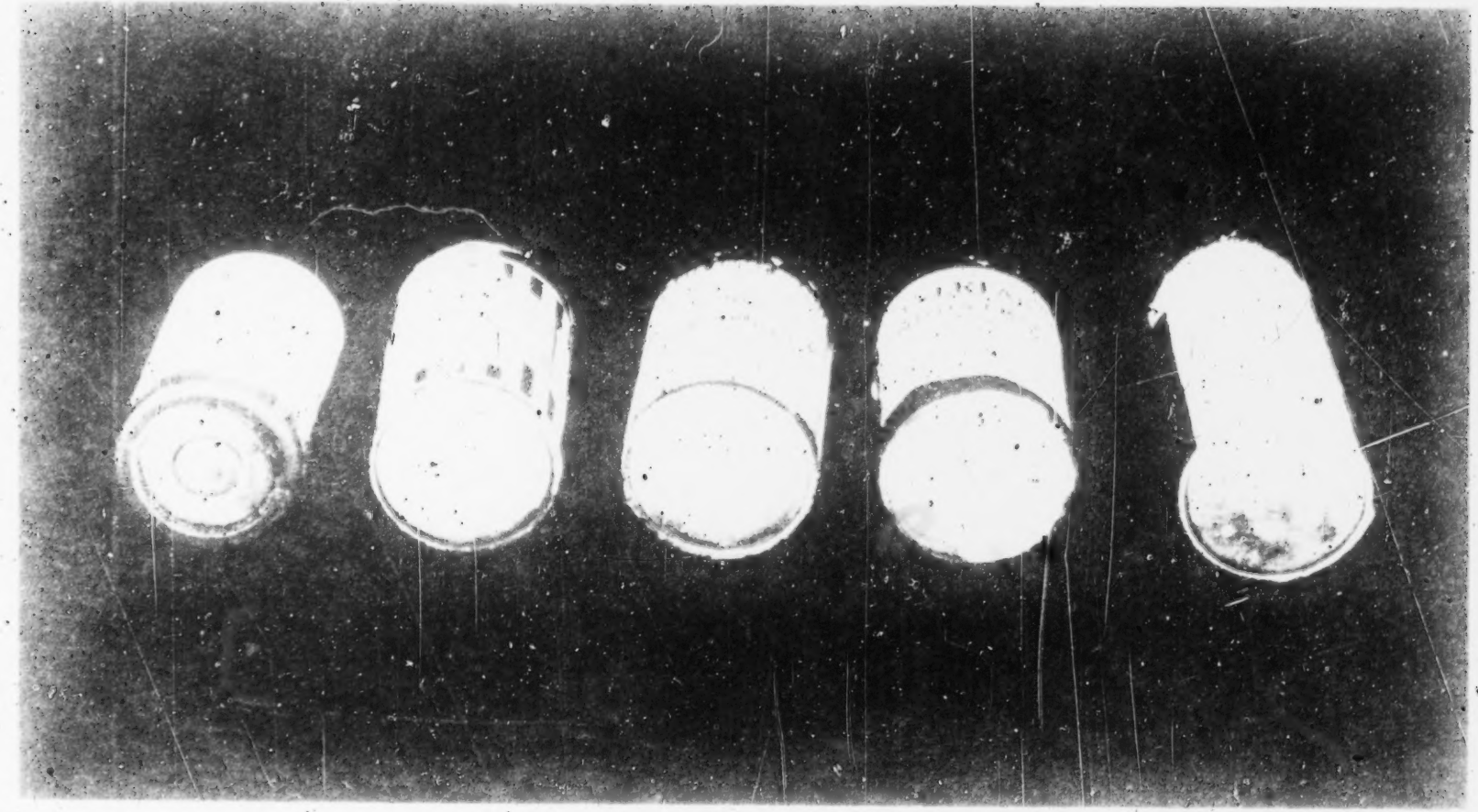
CIVIL ACTION NO. 240-D

PLAINTIFF'S EXHIBIT 21



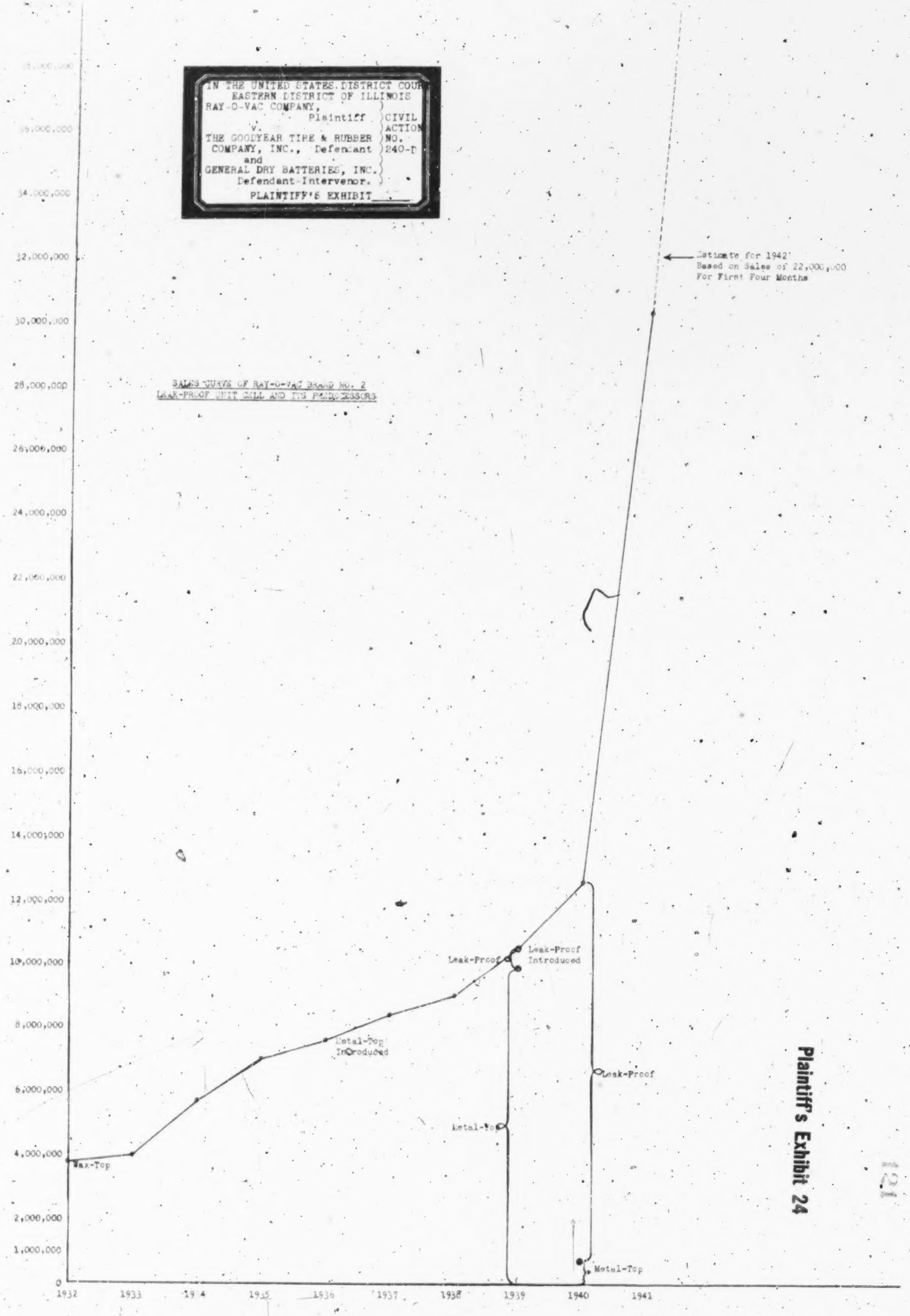
THIS LONG LIFE
BOND
MONO CELL
Flashlight Battery
No. 1050
EVEREADY
INDUSTRIAL
UNIT CELL
FOR
FLASHLIGHTS
MADE IN U.S.A.


Leak



IN THE UNITED STATES DISTRICT COUR
EASTERN DISTRICT OF ILLINOIS
RAY-O-VAC COMPANY, Plaintiff ) CIVIL
v. ) ACTION
THE GOODYEAR TIRE & RUBBER ) NO.
COMPANY, INC., Defendant ) 240-D
and
GENERAL DRY BATTERIES, INC.
Defendant-Intervenor.
PLAINTIFF'S EXHIBIT

SALES CURVE OF RAY-O-VAC BRAND NO. 2
LEAK-PROOF UNIT CELL AND ITS PREDECESSORS



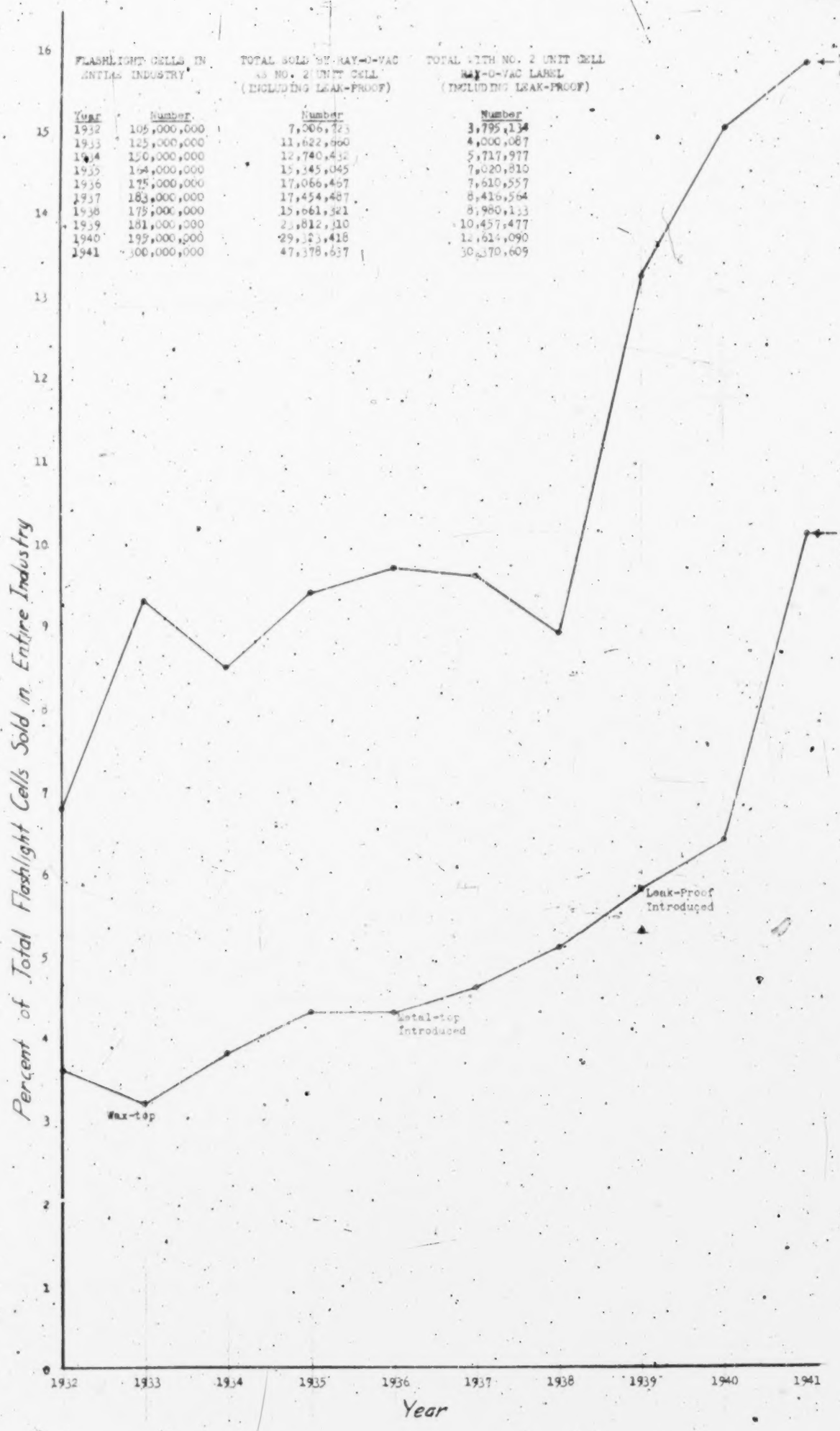

Plaintiff's Exhibit 24

IN THE UNITED STATES DISTRICT COU
EASTERN DISTRICT OF ILLINOIS
RAY-O-VAC COMPANY, Plaintiff, CIVI
v. Acti
THE GOODYEAR TIRE & RUBBER No.
COMPANY, INC., Defendant 240-
and
GENERAL DRY BATTERIES, INC.
Defendant-Intervenor.
PLAINTIFF'S EXHIBIT

CHART SHOWING RAY-O-VAC'S RELATIVE

POSITION IN INDUSTRY WITH NO. 2 UNIT CELL

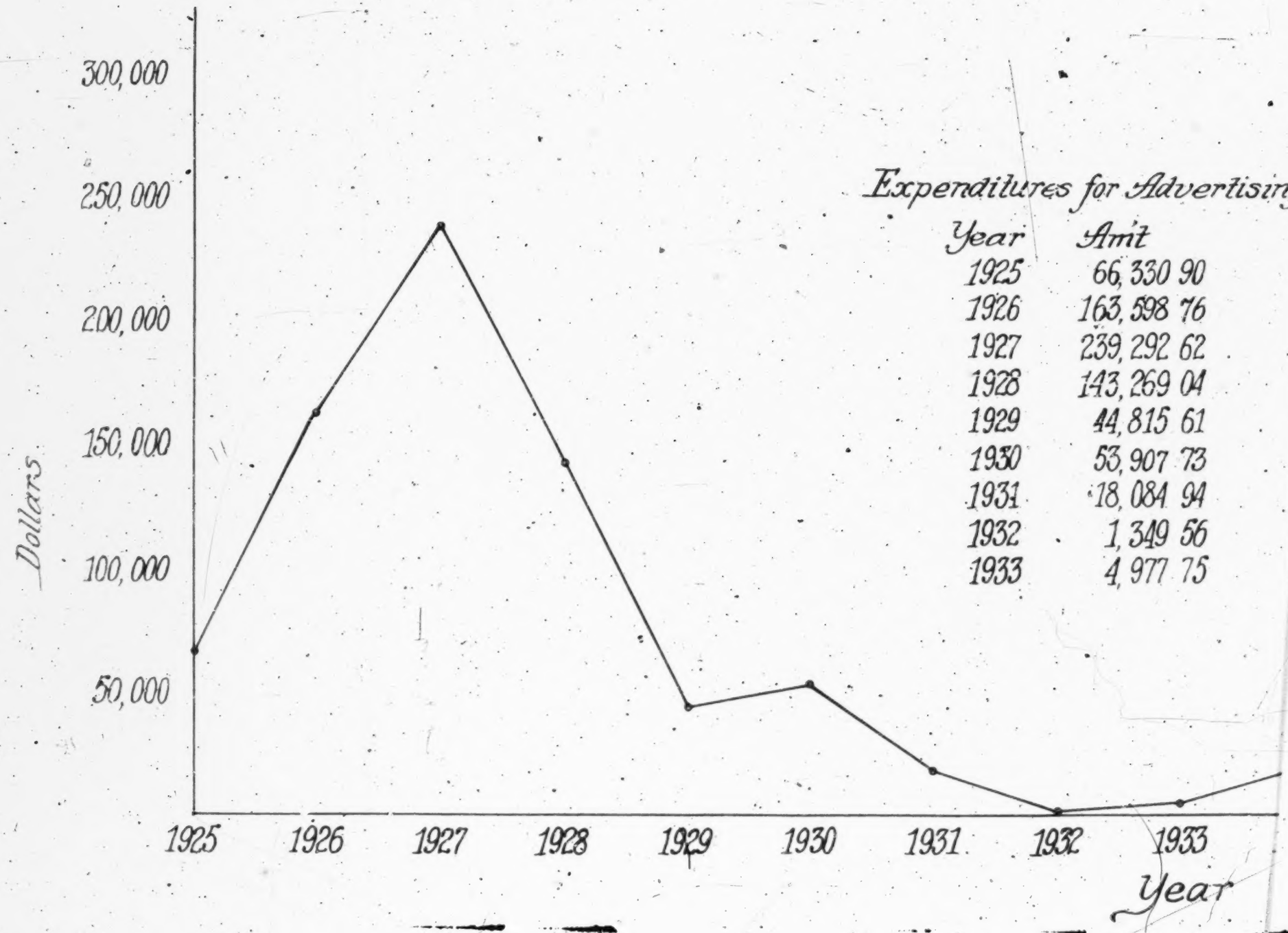
| Year | FLASHLIGHT CELLS IN ENTIRE INDUSTRY Number | TOTAL SOLD BY RAY-O-VAC AS NO. 2 UNIT CELL (EXCLUDING LEAK-PROOF) Number | TOTAL WITH NO. 2 UNIT CELL Ray-O-Vac LABEL (INCLUDING LEAK-PROOF) Number |
|---|---|---|---|
| 1932 | 105,000,000 | 7,506,723 | 3,795,134 |
| 1933 | 125,000,000 | 11,622,660 | 4,000,087 |
| 1934 | 150,000,000 | 12,740,432 | 5,717,977 |
| 1935 | 164,000,000 | 15,345,045 | 7,020,810 |
| 1936 | 175,000,000 | 17,066,467 | 7,610,557 |
| 1937 | 183,000,000 | 17,454,487 | 8,416,564 |
| 1938 | 175,000,000 | 15,061,321 | 8,980,133 |
| 1939 | 181,000,000 | 23,812,110 | 10,457,477 |
| 1940 | 195,000,000 | 29,[illegible]3,418 | 12,614,090 |
| 1941 | 300,000,000 | 47,378,637 | 30,370,609 |




Plaintiff's Exhibit 25

102

Dollars




*Expenditures for Advertising*

| Year | Amt |
|---|---|
| 1925 | 66,330 90 |
| 1926 | 163,598 76 |
| 1927 | 239,292 62 |
| 1928 | 143,269 04 |
| 1929 | 44,815 61 |
| 1930 | 53,907 73 |
| 1931 | 18,084 94 |
| 1932 | 1,349 56 |
| 1933 | 4,977 75 |

*Expenditures for Advertising by Ray-o-Vac Company, 1925-1941.*

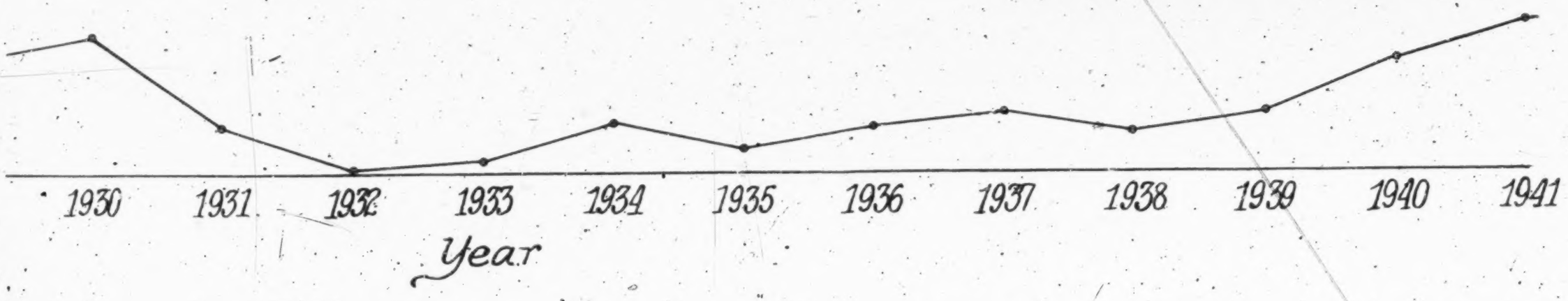
| Year | Amt | Year | Amt |
|---|---|---|---|
| 1925 | 66,330 90 | 1934 | 18,493 31 |
| 1926 | 163,598 76 | 1935 | 9,656 46 |
| 1927 | 239,292 62 | 1936 | 18,889 41 |
| 1928 | 143,269 04 | 1937 | 23,749 32 |
| 1929 | 44,815 61 | 1938 | 15,297 24 |
| 1930 | 53,907 73 | 1939 | 22,701 87 |
| 1931 | 18,084 94 | 1940 | 43,633 22 |
| 1932 | 1,349 56 | 1941 | 57,217 53 |
| 1933 | 4,977 75 | | |

**Plaintiff's Exhibit 26**

IN THE UNITED STATES DISTRICT COUR
EASTERN DISTRICT OF ILLINOIS

RAY-O-VAC COMPANY, Plaintiff, v. THE GOODYEAR TIRE & RUBBER COMPANY, INC., Defendant and GENERAL DRY BATTERIES, INC. Defendant-Intervenor. } CIVIL ACTION NO. 240-D

PLAINTIFF'S EXHIBIT_____



209 And afterwards, on to-wit: the 2nd day of June, A. D. 1942, the following further proceedings were had in said cause in this said Court, and entered of record as follows: Entered June 2, 1942

210 IN THE DISTRICT COURT OF THE UNITED STATES.

(Caption—240-D)

Tuesday, June 2nd, A. D. 1942.

Present: Honorable Walter C. Lindley, Judge Presiding.

Appearances:

Bernard A. Schroeder, Chicago, Ill., Attorney for Plaintiff; Harold F. Lindley, Danville, Ill., Attorney for Plaintiff.

William E. Chilton, Cleveland, Ohio, Attorney for Defendants; Charles W. Williams, Cleveland, Ohio, Attorney for Defendants; Everett L. Dalbey, Danville, Ill., Attorney for Defendants.

Now on this 2nd day of June, A. D. 1942, this cause coming on for Trial before the Court, and upon motion of Everett Dalbey, Attorney for Defendants, the Court grants admission of Wm. E. Chilton and Chas. W. Williams, Cleveland, Ohio as Attorneys for the purpose of this Trial only and without further formality, and counsel answer ready for Trial, the Statements of Counsel are heard, after which Depositions of Meyer Friedman, et al., and of Herman R. C. Anthony, and of Arthur F. Rock are each presented to the Court and each opened and ordered filed. The Evidence of Plaintiff is now heard and Exhibits offered and received as evidence in said cause; after which Plaintiff's Rest. The Defendants' evidence is then heard and exhibits offered and received, after which Defendants Rest. Arguments of Counsel are given after which the Court Orders the Exchange of Briefs within Fifteen (15) Days together with Findings of Fact and Conclusion of Law to be submitted to the Court and Reply Briefs ordered filed within Ten (10) Days thereafter. Said cause is taken under advisement, and each party permitted by the Court to take any or all of their exhibits offered in evidence.

211 And afterwards, on to-wit: the 22nd day of July, A. D. 1942, the following further proceedings were had in said cause in this Court and entered of record, as follows:

212 IN THE DISTRICT COURT OF THE UNITED STATES.

(Caption—240-D)

(Filed July 22, 1942. D. H. Reed, Clerk.)

LINDLEY, *Judge.*

Plaintiff charges defendant with infringement of its patent, to Anthony 2,198,423, for a leak proof dry cell flashlight battery. Defendant asserts invalidity and noninfringement and in a counterclaim pays judgment accordingly. The allegedly infringing cell was manufactured by General Dry Batteries, Inc., who defends the suit.

Dry cells are not of recent origin; indeed, the basic elements involved in their proper construction have been well known for many years. In keeping with the development of electrical devices generally, the flashlight battery industry has grown to the extent that some 300,000,000 batteries were sold in the United States in 1941. Despite this development and the efforts of competing companies to perfect their products, two problems have persistently troubled the trade and the user, viz., leakage of an electrolyte from deteriorated cells and swelling of exhausted cells to the point of destroying the casings in which they are enclosed.

The conventional dry cell employs a cylindrical cup-like zinc electrode serving as a container for a central carbon electrode, electrolyte and depolarizing mix. A closure at the bottom provides the terminal for one electrode and one at the top that for the other. The term dry cell is misleading, for the electrolyte has the consistency of cream, consisting of a mixture of ammonium chloride, zinc
213 chloride, water and starch. After the mixture has been placed in the zinc cup, it is sometimes heated and the starch thereby "gelantinized" into a paste. In use the electrolyte gradually corrodes the zinc until eventually the mixture leaks through the container. Further, if the cell has been short circuited or placed under load for an extended period, certain solids form within as the zinc is

eaten away, with resulting expansion of the contents of the cell, and, as a result, the walls of the cell bulge and break and the liquids inside leak out. These liquids usually include zinc chloride and ammonium chloride and, in a short time, injure the metal walls of the flashlight casing. If the leakage is discovered promptly, damage may be minimized by extracting the leaking cells and cleaning the casing. If leaking cells are permitted to remain in the casing for any extended period of time, however, the metal of the case will be corroded and the cells continue to swell and "freeze" to the casing so as to prevent removal and deform and render useless the case. Because of the danger of damage from leaking cells, companies producing and selling batteries and flashlights have usually warned purchasers to remove batteries from flashlights after they have become dead, show signs of oozing, or the flashlight is to be stored for a period of time.

It was with the idea of remedying these defects and eradicating the trouble that Anthony patented his leak proof battery. Claims 1, 2 and 3 in issue read thus:

"1. A leak impmpiżed flashlight dry cell provided with circuit terminals at opposite ends, comprizing: a hollow cylindrical zinc metal electrode containing electrolyte; a centrally disposed carbon electrode and depolarizing mix in said electrolyte; a bottom closure for the cell affording a terminal for one of the electrodes; a top closure for the cell provided with a terminal for the other electrode electrically insulated from the first mentioned terminal; and a protecting sheet metal sheath insulated from both of said electrodes and enclosing the side walls of said metal electrode and tightly embracing said closures so as to prevent leakage of the electrolyte from the unit.

"2. A device as specified in Claim 1, in which the sheet metal sheath is insulated from both of the electrodes by an interposed sleeve of paper which has been treated to render it moisture resistant and electrically nonconductive.

"3. A device as specified in claim 1, in which the marginal end portions of the metal sheath are turned inwardly to form flanges which overlap the end closures."

Plaintiff admits that all elements included in these claims are old except the last and that the scope of the claimed invention is limited to providing and applying a steel jacket to the conventional cell to make it, for all practical

purposes, leak proof. Under the patent the walls of the steel jacket, insulated from the rest of the cell by interposition of a yielding, nonconducting material, are capable of withstanding great internal pressure without breaking or deformation. The expansion of the weaker zinc wall against the resisting steel jacket presses the insulating material tightly against the steel jacket, so that, even though the electrolyte eats through the zinc wall, it will not penetrate the insulating sheet and the steel walls, or seep downwardly or upwardly. By crimping the steel jacket tightly over the end closures or making the bottom integral with the cylinder, expansion of the cell at the ends is prevented.

The alleged infringing battery is substantially identical with plaintiff's commercial battery, except that the bottom closure of the accused battery is the bottom of the zinc cup, being made noticeably thicker than the zinc side walls to prevent it from corroding and leaking. Plaintiff's commercial device, in addition to the bottom of the zinc cup, which is the same thickness as the side walls, utilizes a steel disc which is held tightly in place by crimping the side walls over it.

Every element in Anthony's combination was shown in one or more prior combinations except that claimed by
215 him in these words: "a protecting sheet metal sheath insulated from both of said electrodes and enclosing the side walls of said metal electrode and tightly embracing said closures so as to prevent leakage of the electrolyte from the unit." This he added to the conventional flashlight battery for the purpose of doing away with the bete noir of battery manufacturers and the bane of consumers, leakage resulting from corrosion and swelling of the cell destroying the flashlight casing or preventing removal of the cell from the container. Plaintiff contends that Anthony was the first to solve these two persistent fundamental problems and frankly admits that his invention lay in providing the insulated steel jacket with firmly gripped end closures for common dry cells so as to withstand gas pressure and mechanical pressure and make the cell practically leak proof.

There is no question under the evidence that the additional element overcame these two trouble makers or that Anthony by his combination solved the problem, not by preventing leakage absolutely but by reducing it to such a minimum as to remove almost entirely the prevalent

troubles. His device met with immediate remarkable success. Not only did the sales of plaintiff increase rapidly but they grew in greater proportions than those of other manufacturers in a highly competitive field. It is established, almost as an undisputed fact, that Anthony contributed great utility to the construction of efficient dry batteries for all practical purposes free of leakage and swelling. To this accomplished utility we must give due weight in determination of whether he achieved invention, for, as the Supreme Court has said, it is entirely proper that evidence of great utility of method or device, in some circumstances, be accepted as evidence of invention. Where the new device satisfies an old and recognized want, invention ordinarily should be inferred, rather than the exercise of mechanical skill, for mere skill of the art would normally have been called into action by the generally known want. *Paramount Corp.* v. *Tri-Ergon Corp.*, 294 U. S. 464, 474.

216 The question of ultimate importance, therefore, is whether what Anthony accomplished was invention; whether, in addition to utility and novelty, what he taught the industry resulted from the exercise of inventive genius on his part or reflected merely the skill of one trained in the art of interpreting the teachings of prior patents and uses of which he had knowledge.

What did Anthony know and with what was he charged in the way of education with respect to the desirability of the metal sheath which he added to the old combination? "The court first looks into the art to find what the real merit of the alleged discovery or invention is, and whether it has advanced the art substantially. If it has done so, then the court is liberal in its construction of the patent, to secure to the inventor the reward he deserved." *Ethyl Process Co.* v. *Minnesota & Ontario Paper Co.*, 261 U. S. 45, 63.

O'Harra in 1882 placed a galvanic battery within an insulating container.

Kohn, as early as 1903 in patent 720,592, taught that where, in a battery, the inner container serves as the positive element, the "excitant" will soon eat through the wall and that by enclosing the zinc container in a retaining vessel, the battery does not become unfit for use until practically all the zinc has been consumed. He specified that the retaining vessel should be of such material as would not be acted upon by the "excitant," suggesting

preferably, brass. It was his idea not to suggest insulation between an outer container and the zinc element but to make the container corrosion resistant.

Byrne, in 1910 in patent 946,009, placed a primary battery in a metal container. He disclosed no purpose to prevent leakage from within but an intent to water proof and protect the battery from rough handling.

Burgess, in 1,188,488 in 1916, called attention to the fact that leakage of cells occurs, leading to their early
217 destruction, and taught that the zinc cup should be enclosed in a wrapping of insulating material. Over this insulated container he slipped a metal cap covering perhaps the upper one third of the cell. Burgess was groping with the problem; he was attempting to prevent leakage and made his prescription of a container of insulated material partially covered by a cap of brass. He did not disclose a complete metal container for the cell, but he did teach use of an insulated container covered in part by another of metal.

Dunn, in the same year in 1,233,204, placed two electric batteries in tandem series in a cylindrical metal container for the purpose of waterproofing the combination and making it strong enough to resist physical contact with other objects.

Olaneta, in his application of August 18, 1920, resulting in 1,623,719 issued April 5, 1927, like Burgess, slipped his battery into a casing of "insulating material," in the shape of a cylindrical can provided with a bottom of the same material, thus completely insulating the contained cell from any object with which it might come in contact. The cell, with its insulating cover, was then placed in an outer container in the form of a cylindrical can of any "suitable metallic material," thus insulated from the zinc cup. He prescribed a snug fit so that the "pitch seal" would not flow between the respective containers and so that his combination prevented short circuiting and furnished protection from entrance of moisture from the exterior. He said that the outer container might be made of hard rubber but that it must be water proof. He evidently was not attempting to prevent leakage from within but seepage from without.

Miller in 1927 in 1,654,823, dealt with a combination to protect the zinc cup from corrosion and swelling. He placed within a metallic casing a container of rubber or other insulating material which in turn held the essential ele-

ments of the cell and then placed between the rubber and the outer metallic casing, absorbent cotton to take up any leakage through the rubber container. He was strug-
218 gling with Anthony's problem and thought he had solved it by prescription of the elements mentioned. His method of solution was far afield from what Anthony did and he disclosed no conception of Anthony's solution.

Smith, in 1930, applied for patent issued November 17, 1936, 2,060,832 saying that he was endeavoring to provide an improved closure or seal for dry cells avoiding various objections encountered in other types of closures. He did not solve the problem confronting Anthony or make any suggestions which could lead by logical deduction to Anthony's conclusion.

In the English patent 438,663, wherein complete specification was accepted November 8, 1935, the patentee described a new closure which would prevent the necessity of sealing the cell with bitumen or any similar composition. The inventor placed his zinc cup within a cylindrical container which he specified should be made of strawboard, fibre or similar insulating material, providing a convenient service for attachment of labels and advertisements. He merely water proofed the cell and made it attractive. He did not teach Anthony how to prevent leakage and swelling. His container would not withstand pressure.

Anthony in his earlier patent of June 11, 1932, 1,991,132 Serial 616,709, struggling with the same problem, made certain suggestions to prevent escape of electrolyte and corrosion but he did not teach what is included in the patent in suit.

Corigliano in 1932 applied for patent, 2,000,540, issued May 7, 1935. He employed the usual cell in a metal cup, in which was inserted a central electrode, and an outer container with insulation between the two latter and the inner cup. He built "a tight seal regardless of temperature conditions," to protect the cell from seepage. He did not prevent swelling or leakage.

Various other delvers in the art discussed the problems with which we are concerned and made their suggestions. None of them, however, accomplished what Anthony did.

219 It is, apparent, therefore, that when Anthony conceived the idea of placing the cell within a metal container insulated from the cell for the purpose of preventing leakage and swelling, he did something that nobody else

had exactly done or taught. Nobody else had solved the problem satisfactorily or suggested the solution which he supplied.

What did Anthony do? He added to the conventional dry cell a strong outer metal container to prevent swelling and leaking, insulated it from the zinc container and sealed the end closures in such manner as to achieve practical prevention of leakage and swelling. He learned from the prior art that metal containers could be used to water proof dry cells. He learned that certain patentees had employed outer containers of insulating and water proofing character. He did not learn from any of them that, by surrounding the zinc cup with an insulated metal container with proper closures, leakage and swelling, to all appreciable extents, could be eradicated. No one of the prior patents contained any such teaching, nor did any of the prior uses offered in evidence disclose any such suggestion. This was his idea, a new and useful one satisfying a long felt want, followed by commercial success, a striking example of which is the acceptance of plaintiff's battery in competitive bidding by the United States Signal Corps, where long life of the battery in the field is highly desirable. Was this merely perfection of workmanship or was it of that impalpable intangible quality constituting invention? While not all improvement is invention, yet every immediate step in advance which rises to the dignity of creation is entitled to protection and it may result from long careful consideration as well as from a flash of thought. Does it spring from that intuitive faculty of the mind put forth for new results, yielding what had not before existed or bringing to light what had previously lay hidden from vision? *Hollister v. Benedict Mfg. Co.*, 113 U. S. 59, 72. Or, if not the product of the intuitive faculty of the mind resulting from a single brilliant event, does it arise from an inventive faculty 220 which has thoughtfully conserved and correlated the causes and effects of movements and mechanisms which enter into a desired result? Obviously, the ideal line which separates invention from things otherwise produced can never be concisely or specifically defined. Every patent must be considered on its own merits. We must not grant to a single party a monopoly for every slight advance in the art. We must attribute invention only to such achievements as contribute substantial discoveries making novel and useful steps in advance in useful art. If a particular

result has been long desired and frequently sought but never attained; ordinarily we may not attribute lack of invention to the device which first achieved the desired result, because it seems that the simplicity of the means is so marked that many believe that they could readily have produced it if required. Barb Wire Patent, 143 U. S. 275, 284. Though the device be simple, and it may seem strange that earlier makers should have failed to take the final step needed to convert their experiments into assured success, the simplicity will not preclude invention. *Carnegie Steel Co.* v. *Cambria Iron Co.*, 185 U. S. 403; *Loom* v. *Higgins*, 105 U. S. 580; *Diamond Rubber Co.* v. *Consol. Rubber Tire Co.*, 220 U. S. 428. Even substitution of metals may constitute invention where it produces a new function and the first practical success in a needed device, in which the substitution makes for increased efficiency. *Edison Electric Light Co.* v. *U. S. Electric Lighting*, 52 Fed. 300, 308. We attribute invention also to a device filling a needed want where an old result is accomplished in a more facile and efficient way. And if there be doubt and uncertainty as to invention, the fact that a device has gone into general use, displacing things which have previously been employed for similar use, is often sufficient to determine the existence of invention. *Boss* v. *Thomas*, 182 Fed. 811. As the Supreme Court observed in *Paramount* v. *Tri-Ergon*, *supra*, if the device satisfies an old and recognized
221 want, if there is any doubt, invention is to be inferred, rather than the exercise of mechanical skill, for the skill of the art normally will have been called into action by the generally known want.

As Judge Alschuler said, speaking for the United States Circuit Court of Appeals for the Seventh Circuit, in 66 Fed. (2) 162 at 164: "What is inventive genius? What is mechanical skill? We apprehend the terms are used for want of better ones, and then, too, they suggest, if they do not define, what the writer has in mind. Moreover, the words are of comprehensive and elastic meaning; the use of which is seldom helpful but nevertheless quite tempting. What is genius? What an inventive genius? May only an inventive genius receive a valid patent? Instead of comparing the mental activities (and accentricities) of genius and the 'Mechanic skilled in the art' it would seem safer and more accurate to study the product itself and, if possible, ascertain the verdict of the public the ultimate beneficiary of the contribution. In most instances, the

judgment of those who pay their money to secure the benefits of the patented article is truer and better than the opinion of experts or the speculations of an arbitrator. Inasmuch as experience is more reassuring than theorizing, and history more certain than prophecy, so the test of public approval, if uninfluenced by detracting factors, must afford the weightiest proof obtainable determinative of invention. In short, in construing the patent statute, which was enacted to promote the useful arts, it is more important to study those developments of the art which are bright with use in the channels of trade than to delve into abandoned scrap heaps and dust-covered books which tell of hopes unrealized and flashes of genius quite forgotten. The somewhat meaningless terms 'inventive genius' and 'mechanical skill' must be clarified by an examination of the article itself, and if the improvement be unusual, or if there be doubt, and the public has given its tribute, the judge should accord to the creator of the article the title of inventor."

222 Invention is not necessarily absent from a patent, however simple, unless what is produced is logically deducible from the prior art. *Williams* v. *American Stringwrapper Co.*, 86 Fed. 644. Here we think there is nothing in the prior art to teach Anthony that what he proposed to do would satisfy the need of the industry. In other words, his conception was not logically deducible from the prior art. His claims are valid.

There is little question as to infringement. Plaintiff's and defendant's batteries are almost identical. Both have the typical zinc cup, the electrolyte, depolarizing compound and the centrally disposed carbon electrode found in the conventional flash light battery. In addition, each has the leak-proof, swelling resistant outer steel jacket insulated from the inner zinc cup, and each jacket grips the end closures firmly.

Defendant asserts its avoidance of infringement in that the bottom end closure of its battery is merely the zinc cup made thicker on the bottom than on the walls, while plaintiff employs an end closure consisting not only of the bottom of the zinc cup while it builds the same thickness as the walls, but also a steel disc.

An examination of the claims in the Anthony patent discloses, however, that there is no narrowed specification as to how the end closures are to be formed. The claim

merely states, "* * * a bottom closure for the cell affording a terminal for one of the electrodes; a top closure for the cell provided with a terminal for the other electrode, electrically insulated from the first mentioned terminal." It is apparent, and plaintiff admits, that the novel element added to the prior art by Anthony was the metal jacket, and that the other elements, including end closures, the electrolyte, zinc cup, and centrally disposed carbon electrode, were all elements utilized in prior art batteries, and included in combination with the new element. It is true that some of the drawings in the patent illustrate a steel disc used as an end closure, but 223 others illustrate a device in which the bottom closure was integral with the walls. In making a metal container the choice of an integral closure or a separate one gripped tightly by the walls was a mechanic's choice.

Defendant can not escape infringement by copying the essential novel element of the patent, and in doing so merely exercise the mechanic's option as to precise method of manufacture in a respect not the essential part of the invention.

Defendant asserts a defense of file wrapper estoppel and claims that plaintiff is limited to Figure 11 of his patent, which was a drawing of a dry cell with a metal disc serving as the end closure instead of merely the bottom of the zinc cup as appeared in Figure 1. The defense must fail since it is concerned with an element old in the art, not essential to the patent and not claimed as an invention by Anthony.

Judgment will enter finding claims 1, 2 and 3 valid and infringed and dismissing defendant's counterclaim for want of equity.

The findings and conclusions herein contained shall be included in my more formal findings and conclusions entered contemporaneously herewith.

Entered this 22nd day of July, A. D. 1942.

Walter C. Lindley,
*Judge.*

And on the same day to wit: the 22nd day of July, A. D. 1942, the following further proceedings were had in said cause in this said Court, and entered of record as follows:

Filed July 22 1942 225

IN THE UNITED STATES DISTRICT COURT.

(Caption—240-D)

## FINDINGS OF FACT.

(Filed July 22, 1942. D. H. Reed, Clerk.)

1. That plaintiff, Ray-O-Vac Company, is a Wisconsin Corporation and has its principal place of business at Madison, Wisconsin.

2. That defendant, The Goodyear Tire & Rubber Company, Inc., is a Delaware corporation and maintains a place of business at Kankakee, Illinois.

3. That General Dry Batteries, Inc., is an Ohio corporation and has its principal place of business at Cleveland, Ohio.

4. That plaintiff, Ray-O-Vac Company, is vested with all right, title and interest in and to Letters Patent of the United States No. 2,198,423, granted April 23, 1940, for Leak-Proof Dry-Cell, on the invention of Herman R. C. Anthony.

5. That the art of dry cells of the type used in flash lights is at least fifty years old and highly developed. There is a large number of companies engaged in the manufacture and sale of dry cells and the industry is highly competitive.

6. That the problem of swelling and leakage of dry cells, particularly used ones, has been well known in the industry, practically from its beginning, by manufacturers and users, but until the Anthony invention in 1938 no practical solution for this problem was offered.

226 7. That Anthony Patent No. 2,198,423 discloses how a dry cell may be immunized against leakage and swelling by providing a steel jacket around the dry cell which is insulated from both terminals and tightly embraces the end closures.

8. That plaintiff, Ray-O-Vac Company, in 1939 began the marketing of a commercial leak-proof cell under the Anthony patent and was the first to guarantee that the cell would not stick in, plug, or damage the users flash light casing.

9. That the Ray-O-Vac Company leak-proof cell met with immediate and great commercial success, its sales increasing from less than 1,000,000 when it was introduced

in 1939 to over 30,000,000 in 1941 and 22,000,000 for the first four months of 1942. This enormous increase in sales was the result of the advantages on the leak-proof construction and not the result of excessive advertising or sales effort.

10. That the best available figures indicate the total number of dry cells sold in the industry varied from 105,000,000 in 1932 to 300,000,000 in 1941. Plaintiff, Ray-O-Vac Company, improved its relative position in the industry substantially after introducing the leak-proof cell, and at the end of 1941, more than 10% of all the estimated flash light cells sold in the United States were leak-proof cells bearing the Ray-O-Vac label.

11. That the advantages of the leak-proof cell construction were recognized by the U. S. Army Signal Corps and by other government agencies as of real importance in military and civilian use, and because of this additional quantities of zinc and steel were made available to Ray-O-Vac Company for its manufacture of said cells, even though a serious shortage of such vital metals existed.

12. That the Anthony Patent No. 2,198,423 discloses and claims an important and meritorious invention. That defendant, General Dry Batteries, Inc., with full knowledge of the patent, manufactured and sold a dry cell known as "General Protex" which is a substantial copy of the commercial Ray-O-Vac, Leak-proof cell and follows closely the teachings of said Anthony Patent No. 2,198,423. That General Dry Batteries, Inc., also manufactured a similar leak-proof cell bearing the trade-mark of defendant, The Goodyear Tire & Rubber Company, Inc., and the latter defendant sold said cells at Kankakee, Illinois, during the year of 1941 with full knowledge of said Anthony patent.

13. That tests conducted on the Ray-O-Vac leak-proof cell show that it out-performs regular commercial No. 2 unit cells which have more zinc, electrolyte, and depolarizing mix than the Ray-O-Vac leak-proof cells. That the patented leak-proof construction in addition to conserving and protecting valuable equipment from losses through leakage and swelling has a markedly improved shelf life. Reliable tests by the U. S. Bureau of Standards show that it will outperform cells which use larger quantities of zinc and electrolyte with the same formula. This is true particularly when the cells of both types are old, and it is also true, but to a lesser degree, when the cells are fresh.

14. That Anthony Patent No. 2,198,423, discloses three embodiments of the invention, Figure 1 shows the conventional cup-shaped zinc electrode, with its bottom wall exposed, Figure 8 also has a cup-shaped zinc electrode and its bottom wall is supported by a disc which provides an exposed bottom terminal for the cell, and Figure 11 shows a zinc electrode formed of a curled sheet of zinc electrically connected to a separately formed bottom wall. A small perforation is shown in the terminal cap of Figure 1, to permit venting of gas, but the cell shown in Figure 8 is completely sealed up with no provision made to release internal pressure.

15. That Ray-O-Vac's leak-proof cell uses a double bottom wall closure of the type shown in Figure 8 of the patent, while the accused cells have a heavy single bot-
228 tom wall closure, formed integrally with zinc electrode as indicated in Figure 1 of the patent; and that in accordance with the teachings of Figure 8 of the patent, Ray-O-Vac's leak-proof cells and the accused cells are completely sealed up to withstand internal pressure.

16. That the file wrapper shows that the application for the patent in suit as originally filed had a broad claim 1, covering all of the embodiments of the invention illustrated, and this claim was narrowed slightly by amendments and finally became claim 1 in suit. That this claim was uniformly treated by the Patent Office and applicant as broad and generic to the various embodiments illustrated. That more specific claims were asserted to the form shown in Figure 1, these claims being transferred to another application and subsequently cancelled without prejudice after a holding by the Patent Office that they were unpatentable over the generic claim in suit.

17. That the patent in suit is not directed to any particular type of top closure, other than one which provides a terminal for the carbon electrode and is tightly gripped by the steel jacket, and the claims do not recite a vent hole in the terminal.

18. That claims 1, 2 and 3 of Anthony Patent No. 2,198,423 are valid and have been infringed by defendant, The Goodyear Tire & Rubber Company, Inc., and defendant, General Dry Batteries, Inc.

## Conclusions of Law.

1. That this Court has jurisdiction of all the parties and of the matter in controversy.

2. That plaintiff is the owner of the entire right, title, and interest in and to Letters Patent in suit No. 2,198,423, with full power to sue for infringement thereof and the right to proceeds of any accounting therefor.

229 3. That Letters Patent in suit No. 2,198,423 are good and valid in law, particularly as to claims numbered 1, 2 and 3 thereof.

4. That there is no file wrapper estoppel limiting the claims of the patent to any particular illustrated embodiment of the invention. That defendants have each infringed upon claims 1, 2 and 3 of Letters Patent in suit No. 2,198,423 granted on the invention of Herman R. C. Anthony, by the sale of dry cells.

5. That plaintiff is entitled to recover from defendants on an accounting, the profits, gains and advantages of defendants and any damages sustained by plaintiff because of the manufacture, use and sale of dry cells made according to and embodying the invention of claims 1, 2 and 3 of Letters Patent in suit numbered 2,198,423.

6. That the cost of this action shall be awarded to plaintiff, and plaintiff shall have judgment and execution therefor.

July 22nd, 1942.

(Signed) Walter C. Lindley,
*United States District Judge.*

Endorsed: In the United States District Court. (Caption—240-D) Findings of Fact and Conclusions of Law Filed Jul. 22—1942. D. H. Reed, Clerk. Chritton, Wiles, Davies & Hirschl, Attorneys at Law, 28th Floor, Board of Trade Building, 141 W. Jackson Boulevard, Chicago, Ill.

230 And on the same day, to-wit: the 22nd day of July, A. D. 1942, the following further proceedings were had in this said cause in this court and entered of record, to-wit:

Entered July 22, 1942. 231 IN THE UNITED STATES DISTRICT COURT.

(Caption—240-D)

## JUDGMENT.

This civil action is before the Court for the entry of a decree following final hearing, submission of the action on arguments of counsel and briefs for both sides, and determination thereof by this Court; and thereupon it is

Ordered, Adjudged, and Decreed as follows:

1. That plaintiff, Ray-O-Vac Company, a corporation duly organized and existing under the laws of the State of Wisconsin, and having its principal, regular, and established place of business at Madison, Dane County, Wisconsin, is vested with the legal title of Letters Patent of the United States No. 2,198,423, granted on April 23, 1940, for Leak-Proof Dry-Cells on the invention of Herman R. C. Anthony, and said Letters Patent is good and valid in law as to claims numbered 1, 2, and 3 thereof.

2. That defendant, The Goodyear Tire & Rubber Company, a corporation duly organized and existing under the laws of Delaware and having a place of business at Kankakee, Kankakee County, Illinois, has infringed upon said Letters Patent to Anthony No. 2,198,423, as to claims numbered 1, 2, and 3 thereof, by its sale of leak-proof dry-cells.

232 3. That defendant, General Dry Batteries, Inc., a corporation duly organized and existing under the laws of the State of Ohio, and having its principal place of business at Clevelapd, Ohio, has infringed upon said Letters Patent No. 2,198,423 as to claims 1, 2, and 3 thereof, by its manufacture and sale of leak-proof dry-cells.

4. That a writ of injunction, directed to defendants, The Goodyear Tire & Rubber Company, Inc., and General Dry Batteries, Inc, be issued out of and under the seal of this Court, permanently restraining and enjoining defendants, their agents, attorneys, servants and employees, and all others acting by and under their direction or authority, their successors or assigns, making, using or selling dry cells or parts thereof made according to and embodying the invention disclosed and claimed in claims 1, 2, and 3 of said Letters Patent of the United States in suit to Anthony Patent No. 2,198,423.

5. That plaintiff shall recover from defendants, the profits, gains and advantages of defendants and also the damages suffered by plaintiff because of defendants' infringement upon said Letters Patent No. 2,198,423 as to claims numbered 1, 2, and 3 thereof.

6. That this case shall be referred to Master Peter Schaefer, of Champaign, who is Master of this Court to ascertain, take, state and report to this Court:

(a) An account of the dry-cells manufactured, used, or sold by defendants made according to and embodying the inventions described and secured in claims 1, 2, and 3 of said Letters Patent No. 2,198,423;

(b) The gains, profits, and advantages which defendants have received or which have risen or accrued to it from infringing upon said exclusive rights of plaintiff in and to said claims of Letters Patent No. 2,198,423; and

233 (c) The damages which plaintiff has suffered by reason of said infringement.

7. That plaintiff on such accounting shall have the right to cause the examination of the defendants, its agents and employees and also to examine their witnesses, and to cause the production and examination of the necessary books, vouchers, records, and documents of defendants and to have all necessary process of this Court to compel such attendance and production before the Master at such times and places as he shall from time to time direct.

8. That the counterclaim in suit be dismissed.

9. That plaintiff recover of defendants its costs and disbursements in this suit taxed by the Clerk, and that plaintiff have execution therefor against the defendants.

(Signed) Walter C. Lindley,
*United States District Judge.*

Danville, Illinois.
July 22nd, 1942.

Endorsed: In the United States District Court. * * (Caption—240-D) * * Judgment. Filed & Entered—Jul-22-1942, D. H. Reed, Clerk. Ent.—Judgment Docket—Page 76-72. Chritton, Wiles, Davies & Hirschl, Attorneys at Law, 28th Floor Board of Trade Building, 141 W. Jackson Boulevard, Chicago, Ill.

Issued July 25, 1942.

234 And afterwards, on to-wit: the 28th day of July, A. D. 1942; the Perpetual Injunction issued July 25th, 1942 by the Clerk of this Court and duly executed by the U. S. Marshal of this District was filed in this cause in this court, which said Perpetual Injunction showing Marshal's Return of Service was and now is in words and figures as follows:

235 IN THE DISTRICT COURT OF THE UNITED STATES.

(Caption—240-D)

PERPETUAL INJUNCTION.

The President of the United States of America to The Goodyear Tire & Rubber Company, Inc., General Dry Batteries, Inc., [redacted], Clerks, Servants, Workmen and Employees, Greeting:

Whereas, a decree having been entered for a Perpetual Injunction:

Now, Therefore, we do strictly command and enjoin, The Goodyear Tire & Rubber Company, Inc., and General Dry Batteries, Inc., your agents, attorneys, clerks, servants, workmen and employees for the remainder of the term of the life of Letters Patent No. 2,198,423 from further infringing the same, from directly or indirectly making or causing to be made, using or causing to be used, advertising for sale, vending, or causing to be sold in any manner, any dry cells, or parts thereof containing and embodying or employing the invention and improvements described in said Letters Patent No. 2,198,423, and claimed therein, and from counterfeiting or from imitating said invention and improvements or any part or parts thereof, in any way, or from infringing upon or violating said Letters Patent in any way whatsoever:

236 Witness the Honorable Walter C. Lindley, Judge of the District Court of the United States, this 25th day of July, 1942, and in the 166th year of the independence of the United States of America.

Attest:

(Signed) D. H. Reed,
*Clerk.*

(Seal)

Endorsed: In the District Court of the United States. (Caption—240-D) * * Perpetual Injunction. Harold Lindley, Danville. Chritton, Wiles, Davies & Hirschl, Attorneys at Law, 28th Floor, Board of Trade Building, 141 W. Jackson Boulevard, Chicago, Ill.

Endorsed: Filed Jul. 28, 1942. D. H. Reed, Clerk.

United States of America }
Eastern District of Illinois } ss.

I hereby certify and return that I have served the within Perpetual Injunction on the therein named The Goodyear Tire & Rubber Company, Inc., and General Dry Batteries, Inc., by handing to and leaving with Everett Dalbey, Attorney for said The Goodyear Tire & Rubber Company, Inc., and General Dry Batteries, Inc., a true and correct copy; that the aforesaid service was made at Danville, Illinois, on the 28th day of July, A. D. 1942.

William Ryan,
*United States Marshal,*
By (Signed) John S. Ray,
*Deputy.*

Marshal's Fees:

| | |
|---|---|
| Service | $2.00 |
| Expense | .06 |
| | $2.06 |

237 And afterwards, on to-wit: the 17th day of August, A. D. 1942, there was filed in the office of the Clerk in this said Court a Notice of Appeal, which said Notice of Appeal was and now is in words and figures following, to-wit:

Filed Aug. 17, 1942. 238

IN THE UNITED STATES DISTRICT COURT,

Eastern District of Illinois.

Ray-O-Vac Company,
*Plaintiff,*
*vs.*
The Goodyear Tire & Rubber Company, Inc.,
*Defendant,*
and
General Dry Batteries, Inc.,
*Defendant-Intervenor.*

Civil Action.
No. 240-D.

## NOTICE OF APPEAL TO THE CIRCUIT COURT OF APPEALS.

Filed Aug. 17, 1942, D. H. Reed, Clerk.

Notice is hereby given that The Goodyear Tire & Rubber Company, Inc., and General Dry Batteries, Inc., Defendants above named, each hereby appeals to the Circuit Court of Appeals for the Seventh Circuit from a Judgment entered July 22, 1942, adjudging United States Letters Patent No. 2,198,423, valid and infringed and providing for the issuance of a Writ of Injunction.

William E. Chilton,
William E. Chilton,
Charles W. Williams,
*Attorneys for Appellants, The Goodyear Tire & Rubber Company, Inc., and General Dry Batteries, Inc.,*
1022 Leader Building,
Cleveland, Ohio.

Cleveland, Ohio,
August 15, 1942.

Everett L. Dalbey,
Everett L. Dalbey,
Adams Building,
Danville, Illinois,
*Of Counsel.*

Fay, Macklin, Golrick, Williams,
Chilton & Isler,
1922 Leader Building,
Cleveland, Ohio,
*Of Counsel.*

239 And on the same day, to-wit: the 17th day of August, A. D. 1942, there was filed in the office of the Clerk in this said cause, a Statement of Points Upon Which Appellants Intend to Rely Upon Appeal, which said Statement of Points was and now is in words and figures following, to-wit: Filed Aug. 17, 1942.

240 IN THE UNITED STATES DISTRICT COURT.

(Caption—240-D)

## STATEMENT OF POINTS UPON WHICH APPELLANTS INTEND TO RELY UPON APPEAL.

Filed Aug. 17, 1942, D. H. Reed, Clerk.

1. The District Court erred in not holding claims 1, 2 and 3 of the Anthony Patent in suit invalid and void.

2. The Court erred in not holding that claims 1, 2 and 3 of the Anthony patent in suit had not been infringed by Defendants and that these claims cannot be maintained in such scope as to cover and embrace any dry cell which Defendants have made, used or sold.

3. The Court erred in failing to hold claims 1, 2 and 3 of the Anthony patent in suit invalid for want of invention and that the alleged invention purported to be patented in the claims in suit did not constitute a patentable invention and that these claims involved nothing more than the exercise of mechanical skill.

4. The Court erred in not holding that if claims 1, 2 and 3 of the patent in suit were given a sufficiently broad interpretation to cover the accused dry cell, then such claims were and are invalid in view of the prior art and prior practice relied upon by the Defendants.

5. The Court erred in failing to hold that the patentee Anthony, in the prosecution of the application which
241 matured into the patent in suit, elected to claim a specific modification of the invention, namely that disclosed in claims 11-13 inclusive and is now estopped to have such claims interpreted sufficiently broad to cover the alleged infringing cell.

6. The Court erred in failing to hold claims 1, 2 and 3 of the patent in suit invalid as being ambiguous and not distinct and failing to particularly point out and distinctly claim the part, improvement or combination which the patentee claimed as his invention or discovery as is required by Section 4888 of the Revised Statutes.

7. The Court erred in failing to hold the claims in suit invalid in view of the prior art relied upon.

8. The Court erred in not finding that the dry cell upon which Plaintiff had considerable commercial success departed from the teaching of the patent in suit.

9. The Court erred in finding that the expansion of the zinc wall against the resisting steel jacket presses the insulating material tightly against the steel jacket so that even though the electrolyte eats through the zinc wall, it will not penetrate the insulating sheet and the steel walls or seep downwardly or upwardly.

10. The Court erred in finding that the thick bottom wall of the zinc cup of the Defendants' cell served to prevent it from corroding and leaking.

11. The Court erred in holding that Anthony's conception was not deducible from the prior art relied upon by the Defendants.

12. The Court erred in failing to hold that the claims in suit should be limited to a dry cell having a double bottom closure.

242 13. The Court erred in finding invention in encasing a single cell in a metal shell over the prior practice of encasing a plurality of such cells in a Metal shell as exemplified by Defendants' prior art V-4-F Battery.

14. The Court erred in not finding that there was file wrapper estoppel limiting the claims of the patent to the particular embodiment of the invention illustrated in Fig. 11.

15. The Court erred in failing to dismiss the Complaint at Plaintiff's costs.

16. The Court erred in not sustaining the Counterclaim and granting the relief prayed for therein.

17. The Court erred in finding that the Plaintiff was

entitled to an accounting to recover from Defendants its profits, gains and advantages.

William E. Chilton,
William E. Chilton,
1022 Leader Building,
Cleveland, Ohio,
*Attorney for Defendants.*

Everett L. Dalbey,
Everett L. Dalbey,
Adams Building,
Danville, Illinois,
Fay, Macklin, Golrick, Williams,
Chilton & Isler,
1022 Leader Building,
Cleveland, Ohio,
*Of Counsel.*

Service of a copy of the foregoing Statement of Points acknowledged this 17th day of August, 1942.

Harold F. Lindley,
*Attorney for Plaintiff.*

243 District Court of the United States of America,

Eastern District of Illinois.

I, D. H. Reed, Clerk of the District Court of the United States for the Eastern District of Illinois, and keeper of the records and seals thereof, do hereby certify that I have this 17th day of August, A. D. 1942, placed in the Mail Chute for outgoing mail at the Post Office, Danville, Illinois copies of the Notice of Appeal to the Circuit Court of Appeals filed this 17th day of August, A. D. 1942 by Everett L. Dalbey, Danville, Illinois and William E. Chilton and Charles W. Williams, Cleveland, Ohio, as Attorneys for Defendants The Goodyear Tire & Rubber Co., Inc., and General Dry Batteries, Inc., in the matter of Ray-O-Vac Company *vs.* The Goodyear Tire & Rubber Company, Inc., et al., Civil Action No. 240-D, copies of said Notice addressed to each of the following Attorneys for Plaintiff and in franked Envelopes:

Lindley, Jones, Grant & Sebat, Adams Bldg., Danville, Illinois.

Bernard A. Schroeder, 2800 Board of Trade Bldg., Chicago, Illinois.

Chritton, Wiles, Davies & Hirschl, 141 W. Jackson Blvd., Chicago, Ill.

In Testimony Whereof, I have hereunto set my hand and affixed the seal of said Court, at my office in the City of Danville, in the District aforesaid, this 17th day of August, A. D. 1942.

D. H. Reed,
*Clerk.*

(Seal)

Filed Aug. 17, 1942.

244 And on the same day, to-wit: the 17th day of August, A. D. 1942, there was filed in the office of the Clerk of this said Court, a $250.00 Bond on Appeal, which said Bond on Appeal was and now is in words and figures as following, to-wit:

245 IN THE UNITED STATES DISTRICT COURT.

(Caption—240-D)

BOND ON APPEAL.

Filed Aug. 17, 1942.

Know All Men by These Presents:

That we, The Goodyear Tire & Rubber Company, Inc., and General Dry Batteries, Inc., as principal, and American Bonding Company of Baltimore, as Surety, are held and firmly bound unto the above named Plaintiff, Ray-O-Vac Company, in the full and just sum of Two Hundred Fifty Dollars ($250.00), to be paid to the said Plaintiff, its successors or assigns, to which payment well and truly to be made we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally by these presents.

Executed this 15th day of August, 1942.

The condition of this obligation is such that:

Whereas, on the 22nd day of July, 1942, in the above entitled action between the above named Plaintiff, Ray-O-Vac Company, and the above named Defendants, The Goodyear Tire & Rubber Company, Inc., and General Dry Batteries, Inc., Judgment was rendered against the said Defendants and the said Defendants have appealed to the United States Circuit Court of Appeals for the Seventh Circuit;

Now, Therefore, if the said The Goodyear Tire &
246 Rubber Company and General Dry Batteries, Inc., shall pay the costs if said appeal is dismissed or the Judgment affirmed, or such costs as the Appellate Court

may award if the Judgment is modified, then the above obligation to be void; otherwise in full force and effect.

The Goodyear Tire & Rubber Company, Inc.,
General Dry Batteries, Inc.,
By William E. Chilton.
American Bonding Company of Baltimore,
*Surety.*
By Paul S. Wise,
Paul S. Wise,
*Attorney-in-Fact.*

(Here Appears Power of Attorney of Willard Cates and Paul S. Wise, both of Cleveland, Ohio, and W. A. Borrie, of Toledo, Ohio, on behalf of American Bonding Company of Baltimore, as surety not to exceed the sum of Two Hundred Thousand Dollars ($200,000).

247 And on the same day, to-wit: the 17th day of August, A. D. 1942, there was filed in the office of the Clerk of this Court in this said Cause, a Petition, which said Petition was and now is in words and figures following, to-wit: Filed Aug. 17, 1942.

248 IN THE DISTRICT COURT OF THE UNITED STATES.

(Caption—240-D)

PETITION.

Filed Aug. 17, 1942.

Now come Defendants by their Attorneys and petition the Court for an Order certifying the documentary and physical Exhibits to the Circuit Court of Appeals for the Seventh Circuit together with the entire Record set forth in the stipulated Designation.

It is further requested that the Clerk be directed to forward the Record to the Clerk of the Court of the Circuit Court of Appeals for the Seventh Circuit, for printing.

William E. Chilton,
William E. Chilton,
*Attorney for Defendants,*
1022 Leader Building,
Cleveland, Ohio.

August 17th, 1942.
It is so ordered:
(Signed) Walter C. Lindley,
*U. S. District Judge.*

Entered Aug. 17, 1942

249 And on the same day, to-wit: the 17th day of August, A. D. 1942, the following further proceedings were had in said cause in this Court and entered of record as follows:

250 IN THE UNITED STATES DISTRICT COURT.

(Caption—240-D)

## ORDER ALLOWING WITHDRAWAL OF PHYSICAL EXHIBITS.

Filed Aug. 17, 1942.

For good cause shown, it is ordered that the following Exhibits may be withdrawn from the files of this Court, by counsel for the respective parties, to be forwarded to the Circuit Court of Appeals for use at the hearing on Appeal:

Plaintiff's Exhibits Nos. 3, 4, 7, 9, 10, 11, 12, 13, 14, 16, 17, 18, 27, 28, 29, 30;

Defendants' Exhibits Nos. A-3, A-4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18.

Walter C. Lindley,
*U. S. District Judge.*

Service of a copy by Clerk is hereby waived.

Approved as to form:

William E. Chilton,
William E. Chilton,
*Attorney for Appellants.*

(Sgd.) Bernard A. Schroeder,
Bernard A. Schroeder,
*Attorney for Appellee.*

Defendants' Exhibits above Rec'd 8-20-42.
By (Signed) E. L. Dalbey,
*Attorney for Defts.*

Plaintiff's Exhibits as above Received Sept. 16, 1942.
By (Signed) Harold F. Lindley,
*Att'y for Pltf.*

251 And afterwards, on to-wit: the 20th day of August, A. D. 1942, there was filed in the office of the Clerk of this Court in this said cause, an Affidavit, which said Affidavit was and now is in words and figures following, to-wit: Filed Aug. 20, 1942.

252 IN THE UNITED STATES DISTRICT COURT.

(Caption—240-D)

## AFFIDAVIT.

Filed Aug. 20, 1942.

State of Ohio, }
County of Cuyahoga. } ss.

William E. Chilton, being first duly sworn, makes affidavit and says that he is attorney of record for the Defendants-Appellants in the above entitled cause and that a copy of each of the pleadings listed below was forwarded by first class mail to Bernard A. Schroeder, Esq., c/o Chritton, Wiles, Davies & Hirschl, Board of Tradé Building, Chicago, Illinois, with proper postage paid thereon; and receipt of copies of such pleadings has been acknowledged by Bernard A. Schroeder, Esq.; and that affiant is reliably informed and believes and therefore avers that copies of such appeal pleadings were left at the office of Harold F. Lindley, Esq., Adams Building, Danville, Illinois, Plaintiff-Appellee's local counsel:

1. Notice of Appeal.
2. Stipulated Designation of Contents of Record on Appeal approved by opposing counsel, Bernard A. Schroeder.
3. Bond on Appeal.
4. Order Allowing Withdrawal of Physical Exhibits.
5. Certificate of Clerk.
6. Statement of Points to be Relied Upon.
7. Petition and Order re Certification of Exhibits.

And further affiant sayeth not.

William E. Chilton.

Subscribed and sworn to before me this 18th day of August, 1942.

Patricia Salem,
*Notary Public.*

(Seal)

My Commission Expires Mar. 26, 1945.

Filed Aug. 21, 1942.

253 And afterwards, on to-wit: the 21st day of August, A. D. 1942, there was filed in the office of the Clerk in this said cause, a Stipulation, which said Stipulation was and now is in words and figures following, to-wit:

254 IN THE UNITED STATES DISTRICT COURT.

(Caption—240-D)

## STIPULATION.

Filed-Aug. 21, 1942.

It is hereby stipulated and agreed by and between counsel for the respective parties, subject to the approval of this Honorable Court, that the Judgment entered in this case on July 22, 1942, be modified to the extent of holding in abeyance the matter of the accounting until the mandate is received from the Circuit Court of Appeals pursuant to the appeal filed herein, and that the Court may enter an Order accordingly, notice by the Clerk being hereby waived.

(Sgd.) Bernard A. Schroeder,
Bernard A. Schroeder,
Board of Trade Building,
Chicago, Illinois,
*Attorney for Plaintiff.*

August 19, 1942.
Harold F. Lindley,
Harold F. Lindley,
Adams Building,
Danville, Illinois,
*Of Counsel.*

William E. Chilton,
William E. Chilton,
1022 Leader Building,
Cleveland, Ohio,
*Attorney for Defendants.*

August 18, 1942.
Everett L. Dalbey,
Everett L. Dalbey,
Adams Building,
Danville, Illinois,
*Of Counsel.*

It is so ordered.

(Signed) Walter C. Lindley,
*U. S. District Judge.*

255 And on the same day, to-wit: the 21st day of August, A. D. 1942, the following further proceedings were had in said cause in this Court and entered of record as follows: Entered Aug. 21, 1942.

256 IN THE DISTRICT COURT OF THE UNITED STATES.

* * (Caption—240-D) * *

Friday, August 21st, A. D. 1942.

Present: Honorable Walter C. Lindley, Judge Presiding.

Now on this 21st day of August, A. D. 1942, the Stipulation by and between counsel for the respective parties, being presented to the Court, and the Court being fully advised in the premises,

It Is Ordered by the Court that the Judgment entered in the above entitled cause on July 22nd, 1942, be and the same is hereby modified to the extent of holding in abeyance the matter of the accounting until the mandate is received from the Circuit Court of Appeals, pursuant to the appeal filed herein.

257 And on the same day, to-wit: the 17th day of August, A. D. 1942, there was filed in the office of the Clerk of this said Court, Designation of Contents of Record on Appeal, which said Designation was and now is in words and figures following, to-wit: Filed Aug. 17, 1942.

258 IN THE UNITED STATES DISTRICT COURT.

* * (Caption—240-D) * *

DESIGNATION OF CONTENTS OF RECORD ON APPEAL.

Filed Aug. 17, 1942.

To the Clerk:

Please prepare a Transcript of Record for the Circuit Court of Appeals in the above entitled cause, and include therein the following papers, Orders and Exhibits:

1. Complaint.

2. Stipulation filed February 4, 1942, permitting General Dry Batteries, Inc. to intervene as Party-Defendant.

3. Joint Answer on behalf of The Goodyear Tire & Rubber Company, Inc., Defendant, and General Dry Batteries, Inc., Defendant-Intervenor, and Counterclaim on behalf of The Goodyear Tire & Rubber Company, Inc., Defendant, and Defendant-Intervenor General Dry Batteries, Inc., both filed February 27, 1942.

4. Answer of Plaintiff, Ray-O-Vac Company, to Counterclaim, filed March 18, 1942.

5. Stipulation dated May 21, 1942. (Pltf.'s Ex. No. 5.)

6. Opinion of the Court dated July 22, 1942.

7. Judgment entered July 22, 1942.

8. Findings of Fact and Conclusions of Law filed July 22, 1942.

9. Writ of Perpetual Injunction, entered July 25, 1942.

10. Transcript of Testimony and Proceedings as follows:

Index of Plaintiff's Exhibits.

Index of Defendants' Exhibits.

Report of Proceedings at the Trial including Depositions of Meyer Friedman, Leonard D. Karcher, D. C. Curtis, William R. Steinmayr, Thomas Richard Bogumill; and omitting part from Page 4, line 5 through line 1; Page 10.

259 11. Notice of Appeal.

12. Bond on Appeal.

13. This Designation.

14. Plaintiff's Exhibits to be reproduced in the printed Record:

Pltf's. Ex. No. 1—Caution Notice

Pltf's. Ex. No. 2—Blake Tag

Pltf's. Ex. No. 6—Anthony Patent No. 2,198,423

Pltf's. Ex. No. 8—Anthony Patent No. 2,243,938

Pltf's. Ex. No. 19—Letter to R. E. Ramsey from War Production Board, May 29, 1942

Pltf's. Ex. No. 20—Letter to Ray-O-Vac from U. S. Army

Pltf's. Ex. No. 21—Photographs of Dry Cells

Pltf's. Ex. No. 22—Letter to Ray-O-Vac from War Production Board, Apr. 14, 1942

Pltf's. Ex. No. 23—Letter from War Production Board to Ray-O-Vac, Apr. 4, 1942

Pltf's. Ex. No. 24—Sales Curves Chart, Ray-O-Vac No. 2, Leakproof and Predecessors

Pltf's. Ex. No. 25—Sales graph of all Cells Sold

Pltf's. Ex. No. 26—Graph of Advertising Expenditures from 1925 to 1941

(The last three to be reduced in size.)

15. The following Letters Patent comprising Defendants' Exhibit No. 10:

| | | | |
|---|---|---|---|
| Ams | 570,591 | Corigliano | 2,000,510 |
| Kohn | 720,592 | Smith | 2,060,832 |
| Burgess | 1,188,408 | O'Harra | 267,577 |
| Armelin | 1,299,813 | Byrne | 946,009 |
| Benner | 1,611,153 | Dunn | 1,233,204 |
| Millar | 1,654,823 | De Olaneta | 1,623,719 |
| Anthony | 1,991,132 | British | 438,663 |

16. Stipulation forming part of Rock Depositions, filed June 1, 1942.

17. Order Allowing Withdrawal of Physical Exhibits.

18. Certificate of the Clerk.

William E. Chilton,
William E. Chilton,
*Attorney for Appellants,*
1022 Leader Building,
Cleveland, Ohio.

Approved:

Sgd. Bernard A. Schroeder,
Bernard A. Schroeder,
*Attorney for Appellee,*
28th Floor Board of Trade Bldg.,
Chicago, Ill.

260 And afterwards, to-wit: the 12th day of September, A. D. 1942, the following further proceedings were had in said court in said cause and entered of record, to-wit:

Entered Sept. 12, 1942.

261 IN THE DISTRICT COURT OF THE UNITED STATES.

(Caption—240-D)

Saturday, September 12th, 1942.

Present:

Honorable Walter C. Lindley, Judge Presiding.

ORDER.

And now on this 12th day of September, A. D. 1942, it appearing to the Court that certain original exhibits, introduced and accepted in evidence in this cause, are necessary to be included in the record to be submitted to the United States Circuit Court of Appeals,

It Is Hereby Ordered By The Court that the following original exhibits, as provided by rule 75 (i) Federal Rules of Civil Practice, be submitted by the Clerk of this Court with his record on appeal, to the said United States Circuit Court of Appeals for the Seventh Circuit:

Plaintiff's Exhibit No. 1—Caution Notice

Plaintiff's Exhibit No. 2—Blake Tag

Plaintiff's Exhibit No. 6—Anthony Patent in Suit 2,198,423

Plaintiff's Exhibit No. 8—Anthony Patent No. 2,243,938

Plaintiff's Exhibit No. 21—Photographs of Dry Cells

Plaintiff's Exhibit No. 24—Sales Curves Chart, Ray-O-Vac No. 2 Leakproof and Predecessors

Plaintiff's Exhibit No. 25—Sales graph of all Cells Sold

Plaintiff's Exhibit No. 26—Graph of Advertising Expenditures from 1925 to 1941

Defendant's Exhibit No. 10—Letters Patent.

Walter C. Lindley,
*United States District Judge.*

Dated September 12th, 1942.

262 DISTRICT COURT OF THE UNITED STATES OF AMERICA

Eastern District of Illinois.

I, D. H. Reed, Clerk of the District Court of the United States for the Eastern District of Illinois, and keeper of the records and seals thereof, do hereby certify that the following Exhibits of both Plaintiff and Defendant are the original Exhibits introduced and accepted in evidence in the matter of Ray-O-Vac Company, Plaintiff-Appellee *vs.* The Goodyear Tire & Rubber Company, Inc., Defendant-Appellant and General Dry Batteries, Inc., Defendant-Intervenor-appellant, in Civil Action 240-D, according to the order of Court entered on September 12th, 1942, which is a part of this record and the Designation of Contents of Record on Appeal, filed on August 17th, 1942 (except the following exhibits, which appear to be included in the Reporter's Report of Proceedings at the Trial:

Plaintiff's Exhibit No. 19, Letter to R. E. Ramsey from War Production Board, May 29, 1942

Plaintiff's Exhibit No. 20, Letter to Ray-O-Vac from U. S. Army

Plaintiff's Exhibit No. 22, Letter to Ray-O-Vac from War Production Board, April 14, 1942

Plaintiff's Exhibit No. 23, Letter from War Production Board to Ray-O-Vac, Apr. 4, 1942.

In Testimony Whereof, I have hereunto set my hand and affixed the seal of said Court, at my office in the City of Danville, in the District aforesaid, this 12th day of September, A. D. 1942.

D. H. Reed,
*Clerk.*

(Seal)

April 23, 1940. H. R. C. ANTHONY 2,198,423

LEAKPROOF DRY CELL

Filed May 31, 1938 2 Sheets-Sheet 1

Fig. 1

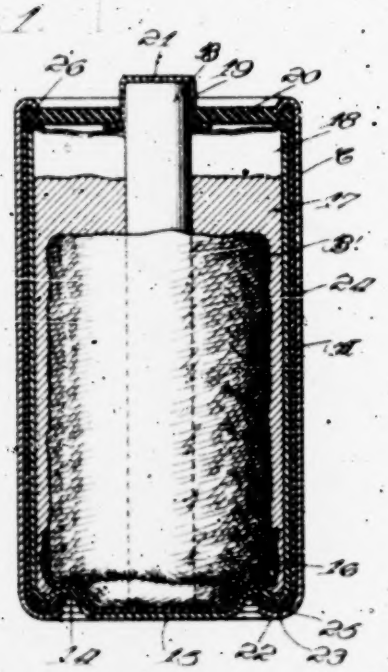



Fig. 4

Fig. 5

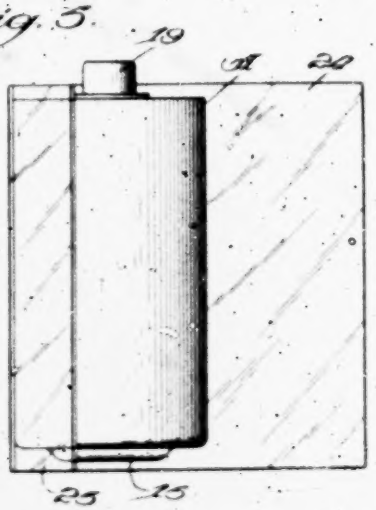



Fig. 2

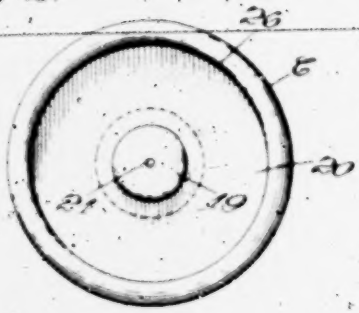



Fig. 6

Fig. 7.

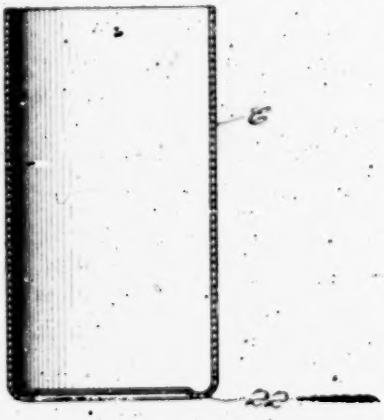
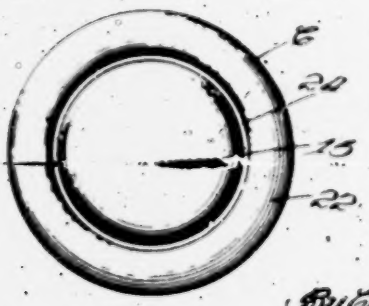



Fig. 3.




Inventor
Herman R. C. Anthony
By Chittick, Wills, Davis, Kirschbaum & Dawson
Attys.

LEAKPROOF DRY CELL

Filed May 31, 1938. 2 Sheets-Sheet 2

Fig. 8.

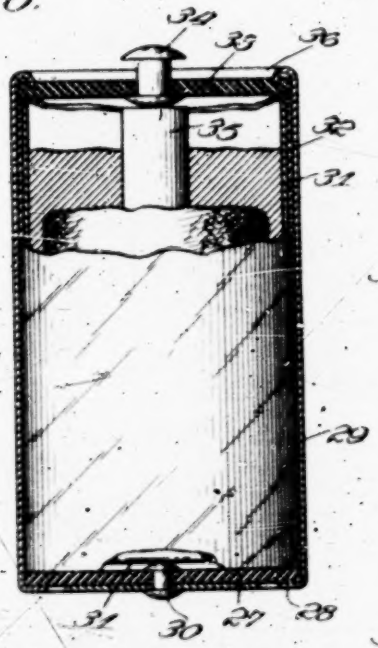



Fig. 9.

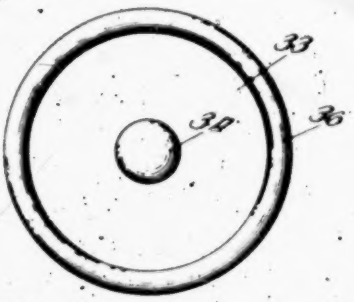



Fig. 10.

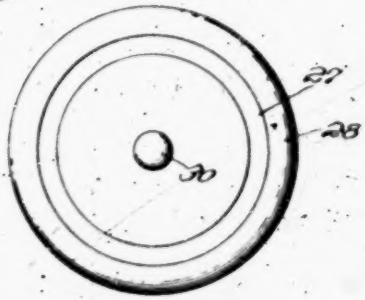



Fig. 11.

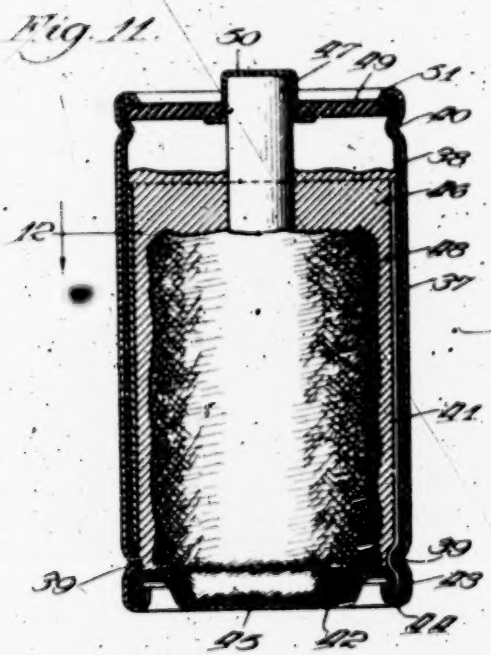



Fig. 12.

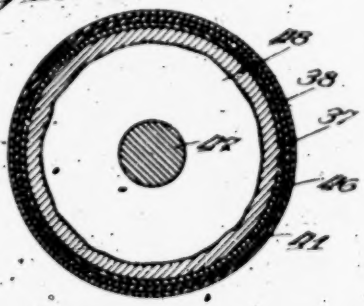
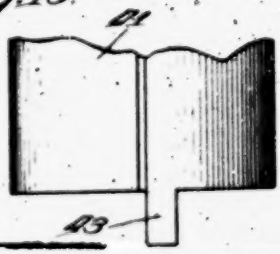



Fig. 13.




Inventor:
Herman R. C. Anthony
By Chittick, Wiles, Davis, Hinds & Dawson
Attys.

Patented Apr. 23, 1940

2,198,423

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# UNITED STATES PATENT OFFICE

2,198,423

## LEAKPROOF DRY CELL

Herman R. C. Anthony, Madison, Wis., assignor to Ray-O-Vac Company, a corporation of Wisconsin

Application May 31, 1938, Serial No. 211,073

8 Claims. (Cl. 136—107)

This invention relates to dry-cells of the type used in flash light casings and the like, and more particularly to an improved protective casing for a cell which will prevent fluids from leaking out of the cell and causing injury to the casing or other dry-cells within the casing.

In using dry-cells it has been a common experience that if the cell is short circuited, or placed under a heavy load for a considerable length of time, the cell will expand and liquids leak out through the walls of the cell. The liquids usually include zinc chloride and ammonium chloride and will, in a short time, injure the metal walls of the casing which are commonly made of brass. If the cell is allowed to remain in the casing for a considerable length of time, it will often swell and freeze to the casing so that it is very difficult to remove it. Frequently two or more cells are used in a single casing and electrolyte leaking from one cell to another will short circuit the adjacent cell so as to destroy its usefulness and aggravate the damage to the casing.

Flash light cells usually are manufactured with a wax coated disk in the bottom part of the cell or cup which partially embraces the end of the depolarizing-mix and retards the action of the electrolyte on the bottom wall of the cup. As a result of this protection, the cup usually gives out first at its side walls, slightly above the bottom, and this is where the electrolyte is most likely to leak out after the cell has been in use for a long period. By protecting the side walls of the cup most of the danger of leakage is avoided, but in some cases it is desirable to provide additional protection for the bottom and top of the cell.

Another object of the present invention is to provide a strong metal sheath which will closely and rigidly confine the cell to a given length and diameter. It has been found that without such protection cells frequently swell so much in diameter that they stick in the casing and sometimes elongate sufficiently to damage the casing. The zinc commonly used as an electrode and as a cup for the electrolyte is too weak by itself to prevent such action.

Another object of the invention is to provide a strong metal sheath or jacket which may be insulated from both terminals of the cell so that it will be unnecessary to use an insulating cover or label to prevent the cell from short circuiting on the side walls of the casing.

The invention is illustrated in preferred embodiments in the accompany drawings, in which:

Fig. 1 is a vertical sectional view of a leak-immunized dry-cell embodying the invention; Fig. 2 is a top plan view of the same; Fig. 3 is a bottom plan view; Fig. 4 is a sectional view of the top closure; Fig. 5 is an elevational view showing an insulating wrapper which is preferably provided between the electrode cup and steel jacket; Fig. 6 is a sectional view of an insulating washer, preferably of rubber, which may be applied between the bottom wall of the cell and the inturned flange of the sheath; Fig. 7 is a sectional view of the metal sheath; Fig. 8 is a fragmentary sectional view showing a modified form of leak-immunized dry-cell; Fig. 9 is a plan view of the top of the cell shown in Fig. 8; Fig. 10 is a bottom plan view of the same; Fig. 11 is a sectional view of another modified form of leakproof cell; Fig. 12 is a sectional view, taken as indicated at line 12 of Fig. 11; and Fig. 13 is a fragmentary elevational view of the zinc electrode used in the device shown in Fig. 11.

In the embodiment illustrated in Figs. 1–7, inclusive, A designates a zinc cup which serves as a negative electrode for the cell; B, a carbon electrode provided with a depolarizing-mix B'; and C, a metal sheath which encloses the cell.

The cup A preferably has an annular groove 16 in its bottom wall to provide a flange to be gripped by the lower flange of the steel jacket and enable an end portion 15 to be flush with the lower end of the jacket. In making up the cell a paper sheet or disk 16 may be placed in the bottom of the cup and bonded to the zinc by heat or pressure to protect the end. A similar protection can be provided by pouring into the can asphalt, wax, or other free flowing and self-hardening material. Electrolyte 17 is poured into the casing, and the carbon pole B with its depolarizating-mix B' forced down into the cup so that the electrolyte will well-up towards the top of the casing but will allow an air space 18 for gas pressure. Preferably the upper end of the carbon pole B is provided with a flanged cap 19 which snugly fits into an aperture provided in an insulating disk 20 which forms an end closure for the cell. A perforation 21 in the end cap permits venting of gas through the carbon terminal.

The sheath C preferably is made of sheet iron and may be of tubular form with its lower end turned inwardly to form a flange 22. A rubber sealing washer 23 may be placed on the flange 22 before the cell is inserted. In most cases it is desirable to insulate the casing A from the jacket C, and this may be done by wrapping a

sheet 24 of insulating material such as rubber, treated paper or the like, around the cell and tucking the lower ends 25 inwardly. The cell is then forced into the jacket and pressed firmly against the washer 23. The top closure 20 is then forced over the cap 19 and the top edges of the steel jacket are spun inwardly so that the jacket tightly embraces both ends of the cell. Preferably, a spun flange 26 bites into a groove provided in the closure 20 so that a very tight joint is provided.

With a cell of the character above described, internal pressure formed by gas and expansion of the electrolyte during use will further tighten the end joints so that no liquid can escape. The air space 18 permits expansion of the electrolyte and the gas may slowly escape through the perforation 21.

If desired, the outer walls of the casing C may be polished and lacquered so as to provide a very attractive appearance and suitable surface for a decalcomania transfer label. In the event that the insulating sheet 24 is omitted, a suitable insulating cover of cardboard or the like should be provided.

In the embodiment illustrated in Figs. 8–10, inclusive, an insulating closure 27 is provided to rest on the inside of an end flange 28 of a steel jacket 29. A rivet-like terminal 30 is centrally disposed in the closure member so as to make contact with the bottom of a zinc cup 31. Preferably, an insulating sheet 32 separates the steel jacket from the zinc cup. A top closure 33 is also an insulating disk provided with a terminal 34 adapted to contact a carbon electrode 35. After the device has been assembled, an end flange 36 may be spun into the disk 33. It may be noted in this form that the cell is fully enclosed at both ends and internal pressure will further tighten the connection.

In the modification shown in Figs. 11–13, a zinc cup is not used but the cell is built up within a tubular steel casing 37 in the following manner. A sleeve of insulating material 38 is placed within the cylindrical shell 37 and grooves 39 and 40 are turned in the casing to provide abutments for the end closures. A curled sheet of zinc 41 is attached to bottom wall 42 by means of a finger 43 and the base is then gripped against the abutment formed by the groove 39 by spinning the lower end of the jacket 37 around the edges of the bottom wall 42, as indicated at 44. The bottom wall is protected from the action of the electrolyte by means of an inert disk or sealing wax 45. After electrolyte 46 has been poured into the container, the carbon pole 47 with the usual depolarizing-mix 48 is introduced and the insulating closure 49 is fitted over the cap 50 and against the abutment formed by the groove 40. The upper end of the casing 37 is then spun tightly against the end closure, as indicated at 51, and the cell is ready for use.

As will be readily understood, the inside of the sheet-metal jacket may be sprayed with suitable insulating material, such as emulsified asphalt or the like, instead of using a sheet or collar of insulating material.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, for modifications will be obvious to those skilled in the art.

I claim:

1. A leak-immunized flash light dry-cell provided with circuit terminals at opposite ends, comprizing: a hollow cylindrical zinc metal electrode containing electrolyte; a centrally disposed carbon electrode and depolarizing-mix in said electrolyte; a bottom closure for the cell affording a terminal for one of the electrodes; a top closure for the cell provided with a terminal for the other electrode, electrically insulated from the first mentioned terminal; and a protecting sheet-metal sheath insulated from both of said electrodes and enclosing the side walls of said metal electrode and tightly embracing said closures so as to prevent leakage of the electrolyte from the unit.

2. A device as specified in claim 1, in which the sheet-metal sheath is insulated from both of the electrodes by an interposed sleeve of paper which has been treated to render it moisture resistant and electrically non-conductive.

3. A device as specified in claim 1, in which the marginal end portions of the metal sheath are turned inwardly to form flanges which overlap the end closures.

4. In combination: a cell provided with circuit terminals at opposite ends; and a liquid tight housing completely enclosing said cell, said housing having a sheet-metal side wall and end walls provided with exposed contact members insulated from each other and insulated from the sheet-metal side wall, each of said contacts being in electrical engagement with one of the cell terminals.

5. A unit as specified in claim 4, in which the end walls of the housing comprise disks of strong insulating fibrous material and the contact members are embedded in said disks.

6. A dry-cell comprising: a tubular shell of ferrous sheet-metal having an inner coating of acid resisting material, a metallic base closure fixed to the lower end of said shell and insulated therefrom; a metal electrode in said shell electrically connected to the base closure; a centrally disposed carbon electrode and depolarizing-mix in the shell; electrolyte partially filling said shell; and a top closure of insulating material fixed to the upper end of the shell to seal the cell against the escape of liquid and having a terminal member insulated from said shell and making electrical contact with said carbon electrode.

7. A unit as specified in claim 6, in which the shell has inwardly directed grooves forming abutments for the end closures, and the end closures are hermetically sealed against said abutments by the ends of the shell clamping thereagainst.

8. A unit as specified in claim 6, in which the metal electrode comprises an open ended curved sheet of zinc.

HERMAN R. C. ANTHONY.

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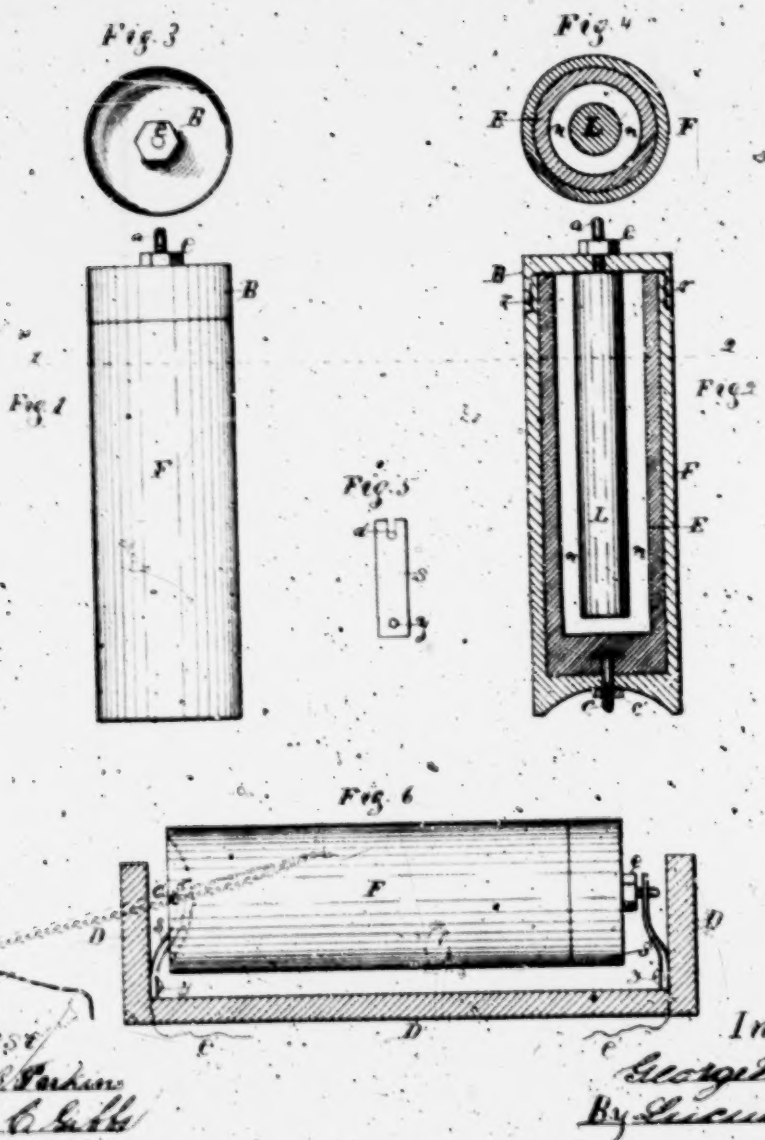
(No Model.)

# G. W. O'HARRA.

## GALVANIC BATTERY.

No. 267,577. Patented Nov. 14, 1882.




Witnesses:
John C. Parker
Frank C. Gibbs

Inventor:
George W. O'Harra
By Lucius C. Hurd
Atty.

# UNITED STATES PATENT OFFICE.

GEORGE W. O'HARRA, OF KALAMAZOO, MICHIGAN, ASSIGNOR OF ONE-HALF TO JOHN A. HOEDEMAKER, OF SAME PLACE.

## GALVANIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 267,577, dated November 14, 1882.

Application filed April 25, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. O'HARRA, a citizen of the United States, residing at Kalamazoo, county of Kalamazoo, State of Michigan, have invented a new and useful Galvanic Battery, of which the following is a specification.

My invention has for its object certain improvements in the construction of galvanic batteries, for the purposes hereinafter set forth.

The battery to which my invention relates is especially intended for use in a portable hand-cabinet.

In the drawings forming a part of this specification, Figure 1 is a side elevation of the battery-case; Fig. 2, a longitudinal section, showing the internal construction; Fig. 3, top view of Fig. 1; Fig. 4, cross-section on line 1 2 in Fig. 1; Fig. 5, detached part of Fig. 6, and Fig. 6 shows the battery-case or cell located in the cabinet.

In the construction of my battery, E is a cylindrical cup or vessel, either zinc or carbon, placed within a rubber cup, F, adapted to receive it, as shown in Fig. 2. These cups are covered by means of a cover, B, also made of rubber, which is screwed on the rubber cup F. In the cup E is suspended a stick of carbon or zinc, L. When cup E is made of carbon stick L is made of zinc, and vice versa. The generating-liquid used in the battery-cell is placed in cup E around stick L in the space *n n*.

By forming the zinc and carbon in the manner above described, and thus associating them with the generating-fluid, a greater surface of said parts is presented in a given size battery to the action of said fluid. Other advantages are, less danger of leakage and greater convenience in construction and operation.

The poles *a* and *c* of the battery are located in each end and form axial bearings to support the cylindrical cell in a horizontal and a revoluble position in the cabinet *d*, Fig. 6. Pole *c* is embedded secure in the inclosed end of cup E and extends through the corresponding end of cup F, and pole *a* is secured in the end of stick L and extends through cover B, where it is held secure by nut *e*. Nut *e'* on pole *c* secures cup E in cup F. The parts *a c* thus serve the triple purpose of poles to the battery, a means of securing the zinc and carbon in place, and as axes of the cups or cell. This battery-cylinder is supported in the cabinet D, Fig. 6, by means of two supports, *s s*, made something in the form of a letter S, by locating poles *a c* in the open slots *d* in the upper end of said supports. By this means the cell may be revolved by passing the palm of the hand transversely over it when desiring to agitate the generating-fluid to increase the electrical current. The supports *s s* also serve as positive and negative electrodes, with which wires *e' e'* may be attached. The inclosed end of cup F is formed concave, as in Figs. 2 and 6, in order that said end may be provided with pole and axis *c* and still admit of setting the cell on the end, as in Fig. 1, when filling it with liquid.

The revoluble cell is described as being cylindrical; but it may be any form desired, which will not interfere with its being revolved on its axis.

Having thus described my invention, what I claim as new is—

1. In a galvanic battery, a cell composed of a cup of zinc or carbon located within a rubber cup, said inner cup being provided with an axis-pole secured in its inclosed end and extending out through the end of the rubber cup, the opposite end of the cell also being provided with an axis-pole secured in the end of the stick of zinc or carbon and extending out through the cover, in combination with a cabinet provided with axial supports, all substantially as set forth, for the objects specified.

2. The combination, with the rubber cup, having the concave recess in the inclosed end, the inner cup, having the pole secured thereto and passing out through the end of the rubber cup into said concave recess, the opposite end of the cell also having a pole serving as an axis, of a cabinet provided with the S-shaped supports at each end of the cell, all substantially as described and shown, for the objects stated.

3. The combination, with a cabinet provided

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with axial supports, of a cell having an axis at each end revolubly located in said axial supports, substantially as described.

4. A cell having an axis at each end, in combination with a cabinet having axial supports, provided with open slots in the upper end, whereby the cell is both detachably and revolubly supported by said axial supports, substantially as set forth.

5. A revoluble cell provided with axial bearings at each end, said cell having a concavity in one end, substantially as described and shown.

GEORGE W. O'HARRA.

Witnesses:
FRANK C. GIBBS,
JOHN W. ROWLEY,

170 (No Model.)

# M. AMS.

## SHEET METAL CAN.

No. 570,591 Patented Nov. 3, 1896.

FIG. 1.

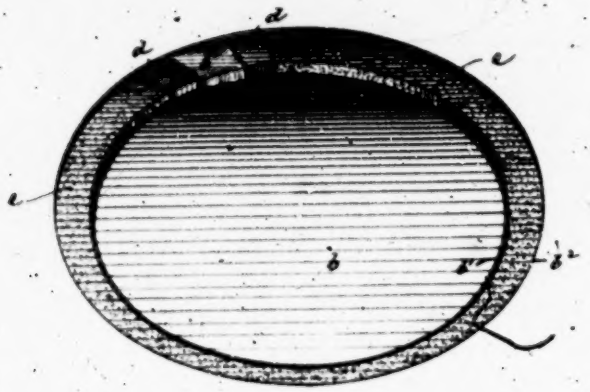



FIG. 2.

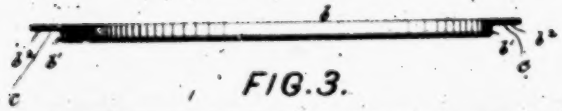



FIG. 3.

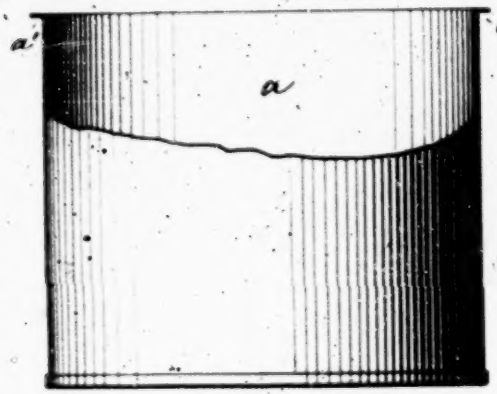



FIG. 4.

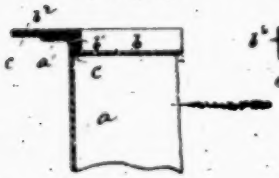
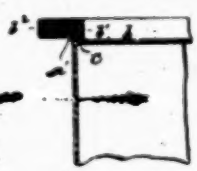


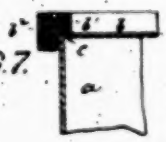

FIG. 5.

FIG. 6.




Witnesses:
Joseph Becker.
Willie Miller

FIG. 7.




Inventor:
Max Ams
by his attorneys
Raeder & Brown

# UNITED STATES PATENT OFFICE.

MAX AMS, OF NEW YORK, N. Y.

## SHEET-METAL CAN.

SPECIFICATION forming part of Letters Patent No. 570,591, dated November 3, 1896.

Application filed July 28, 1896. Serial No. 600,738. (No model.)

*To all whom it may concern:*

Be it known that I, MAX AMS, of New York city, New York, have invented an Improved Sheet-Metal Can, of which the following is a specification.

This invention relates to a sheet-metal can designed for packing food products, and more particularly to an improved construction of the seam between the can-body and the cover.

In the accompanying drawings, Figure 1 is a perspective view of the cover; Fig. 2, a longitudinal section thereof; Fig. 3, a similar section through the can-body. Figs. 4, 5, 6, and 7 are sections through the joint, showing it in successive stages of completion.

The letter *a* represents the body of a sheet-metal can, flanged at its upper end, as at *a'*. The sheet-metal cover *b* is countersunk or depressed at its center, so as to be provided with an upright neck or shoulder *b'*, which is adapted to fit snugly within the opening of the can-body. Around this neck the cover is provided with the laterally-extending flange $b^2$, which should be considerably wider than the flange *a'*. After the cover has been pressed into the above-described form its neck *b'* and flange $b^2$ are covered with an air-excluding adhesive body *c*, that adheres to the cover and constitutes in effect a packing. This coating consists of a layer of rubber cement *d*, Fig. 1, which may be applied to the parts *b' b²* with a brush, and of a thin layer of asbestos pulp *e*, which forms a film on the surface of the cement.

When the can is to be sealed, the cover, prepared as described, is placed upon the chime so that its countersunk central section projects into the can-body, Fig. 4. The projecting part of the flange $b^2$ is next crimped downward, Fig. 5, then inward, Fig. 6, and then the two flanges are jointly bent downward to produce a lap-joint, Fig. 7, when the operation is completed.

It will be seen that with my improvement a perfectly-tight joint is produced without the use of solder or washers. The packing or sealing body does not only extend into every portion of the lap-joint, but it also extends between the inner surface of the can-body and the neck *b'* of the cover. To this feature I attach considerable importance, because it insures a tight seating of the cover and a tight packing independent of the lap-joint.

The rubber in my improved packing forms the air-excluding body proper, while the asbestos forms a coating or skin upon the surface of the same which greatly increases the tightness of the joint. Thus a packing of superior merit is produced, and, moreover, the resistance offered by the ordinary washers to the crimping operation and the consequent frequent imperfections of the seam are entirely avoided.

What I claim is—

The combination of a sheet-metal can with a flanged and countersunk cover and with an adhesive coating secured to the cover, and consisting of rubber cement and an asbestos film, substantially as and for the purpose specified.

MAX AMS.

Witnesses:
F. v. BRIESEN,
WILLIE MILLER.

174 No. 720,592. PATENTED FEB. 17, 1903.

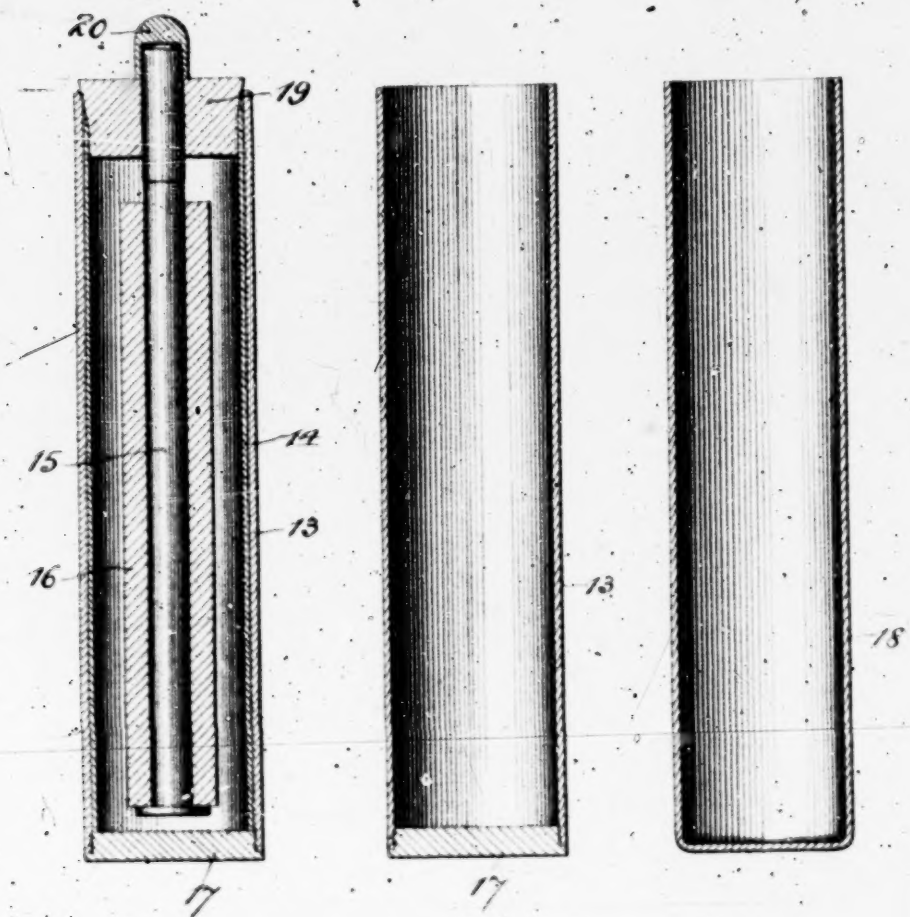
M. M. KOHN.

ELECTRIC BATTERY.

APPLICATION FILED JULY 31, 1899.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1 Fig. 2 Fig. 3




Witnesses
Wm. F. Hemming
Ray White.

Inventor
Milton M. Kohn
By Bonde Thurston Burke & Jackson
Attys.

176 No. 720,592. PATENTED FEB. 17, 1903.

M. M. KOHN.

ELECTRIC BATTERY.

APPLICATION FILED JULY 31, 1895

NO MODEL. 2 SHEETS—SHEET 2.

Fig 4

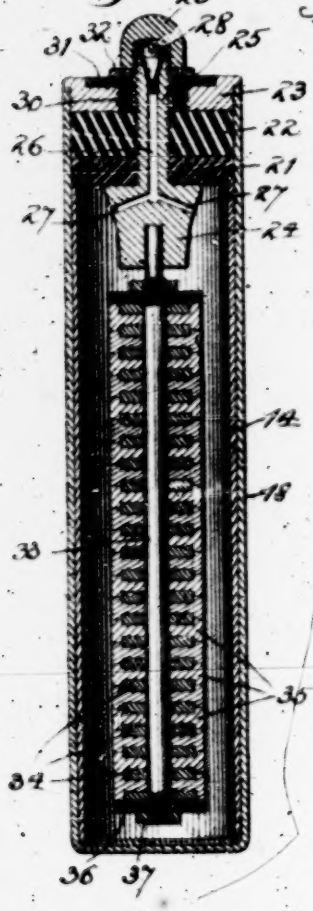



Fig 6

Fig. 7.

Fig. 5.

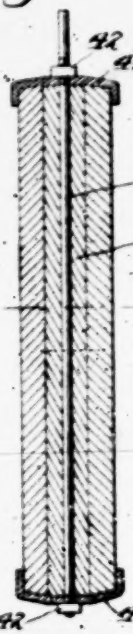



Fig. 11.

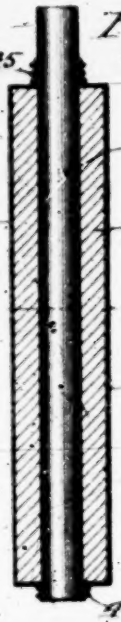



Fig 8

Fig. 12.

Fig 10

Fig 9

Witnesses
Wm. F. Fleming
Ray White.

Inventor
Milton M. Kohn
by Bond Adams Burke and Jackson
Attys

# UNITED STATES PATENT OFFICE. 177

MILTON M. KOHN, OF CHICAGO, ILLINOIS.

## ELECTRIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 720,592, dated February 17, 1903.

Application filed July 31, 1895. Serial No. 557,661. (No model.)

*To all whom it may concern:*

Be it known that I, MILTON M. KOHN, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric Batteries, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical section of a cell. Fig. 2 is a vertical section of the retaining vessel or shell. Fig. 3 is a similar view showing a modified form of retaining vessel. Fig. 4 is a vertical section showing the preferred form of cell. Fig. 5 is a vertical section of the negative element and the depolarizer. Fig. 6 is a cross-section on line 6 6 of Fig. 5. Fig. 7 is a perspective view of one of the sections of the depolarizer. Fig. 8 is a vertical section of the cap which closes the cell. Fig. 9 is a plan view of the same. Fig. 10 is a perspective view of one of the depolarizer-disks. Fig. 11 is a vertical section of the negative element, showing a modified arrangement of the depolarizer; and Fig. 12 is a cross-section on line 12 12 of Fig. 11.

My invention relates to electric batteries, and particularly to that class commonly known as "dry" batteries.

It has for its object to provide certain improvements in dry batteries, by which a battery will be produced having greater efficiency than any commercial cell heretofore produced, which may be more conveniently handled, which will be longer lived, and which will have various other advantages, as will be hereinafter set forth.

That which I regard as new will be set forth in the claims.

As illustrated in Fig. 1, my improved battery, broadly considered, comprises a retaining vessel 13, of metal or some other good conductor of electricity, a positive element 14 in contact with the interior surface of the retaining vessel, a negative element 15 within the retaining vessel, a depolarizer 16 around said negative element, and a suitable excitant or electrolyte. The retaining vessel 13 is preferably cylindrical in form and is open at one end. If desired, it may be formed of a piece of tubing having a cap 17 secured at one end by screwing or otherwise, or it may be formed of a single piece of metal spun or drawn into shape, as shown at 18 in Fig. 3.

In the simplest form of the battery, as shown in Fig. 1, the negative element, of carbon, is incased in a cylinder 16 of suitable depolarizing material, such as copper oxid mixed with copper chlorid. Other depolarizers, both in solid and liquid form, may, however, be used. An ordinary stopper 19 is inserted in the upper end of the retaining vessel, such stopper being of suitable insulating material. The upper end of the carbon is preferably copper-plated to increase its conductivity, and over its upper end is soldered a cap 20, said cap being in contact with the carbon and serving as a means through which electrical contact may be made with the carbon. It will thus be seen that the positive element, preferably zinc, is in contact with the outer or retaining shell throughout its entire surface and that electrical connection with such positive element may be made by contact with the retaining vessel, thus avoiding the use of binding-screws and other similar devices heretofore commonly used. Another important advantage of this construction is that the life of the battery is greatly increased over the life of the dry batteries heretofore commonly used, in that in such batteries heretofore used the positive element has itself served as the retaining vessel, and as after a short time the excitant would eat through the cell the usefulness of the battery would be destroyed before the mass of the zinc would be consumed. In my improved cell, however, the zinc being inclosed in a retaining-vessel the battery is not unfitted for use until practically all the zinc has been consumed. It will be understood that the retaining vessel must be of such material as will not be chemically acted upon readily by the excitant used. The vessel 13 is preferably of brass, the positive lining 14 being of zinc. The preferred electrolyte depends on the negative element employed. If the negative element is oxid of copper, a solution of caustic soda or potash will be employed as the electrolyte. If the negative element consists of carbon or peroxid of manganese, sal-ammoniac solution will be used as the electrolyte. With the negative element composed

of a silver compound, chlorid of zinc solution will constitute the electrolyte.

While the form of cell shown in Fig. 1 is one of the simplest, embodying that part of my invention which is above described, I prefer to manufacture cells having the construction shown in Fig. 4, which differs from the other in that the negative element is of superior construction and the cell is hermetically sealed and provided with a valve for relieving the pressure in the cell when it is desired to open it, as will be hereinafter described.

Referring to the form shown in Fig. 4, a retaining vessel 18 is used similar to that shown in Fig. 3. Within the retaining vessel 18 is the positive element 14, of zinc, substantially as shown in Fig. 1. As shown in Fig. 4, the retaining vessel projects a short distance beyond the positive element 14 and is screw-threaded at its upper end. Within the upper end of the retaining vessel, immediately above the positive element, is an insulating-disk 21, fitting snugly into the upper portion of the retaining vessel. Above the insulating-disk 21 is a rubber disk 22, which fits tightly into the retaining vessel. Above the rubber disk is screwed a cap 23, which screws down into and closes the upper end of the retaining vessel.

24 indicates a valve and connector, having a stem 25, which passes through the insulating-disk 21, the rubber disk 22, and the cap 23.

26 27 indicate passages in the valve 24, extending from the interior of the cell to the exterior thereof.

28 indicates a screw or plug which fits into the upper end of the stem 25, closing the passage 26.

29 indicates a cap which is fitted upon the upper end of the stem 25, which is screw-threaded, so that the cap may be screwed down tightly thereupon.

The valve 24 is of suitable conducting material and serves as a conductor of the current from the negative element to the cap 29.

The stem 25 and cap 29 are insulated from the cap 23 by an insulating-ring 30 and an insulating-washer 31.

32 indicates a nut which rests upon the washer 31 immediately under the cap 29. The nut 32 screws upon the stem 25, thereby serving to draw up the valve, causing its lower broad portion to expand the rubber disk 22 laterally as it is compressed between the valve and the cap 23. A tight closure of the cell is thereby effected.

The object of the valve 24 is to permit of the discharge of the gas which is formed by the action of the battery within the cell. After the battery has been working for a short time it causes considerable pressure within the cell, and in order that the cap 23 may be safely removed it is necessary that the pressure should be relieved, which may be done by removing the cap 29 and screw 28.

33 indicates a rod the upper end of which is secured to the valve 24, preferably by being soldered in a suitable recess therein. The rod 33 is of suitable conducting material and has mounted upon it a series of carbon disks 34 and depolarizer-disks 35, arranged alternately, as shown in Fig. 4.

36 indicates an insulating-disk arranged at the lower end of the rod 33 for supporting the various disks 34 35, and 37 indicates a nut, also of insulating material, which is screwed upon the lower end of the rod 33.

As best shown in Figs. 4 and 10, depolarizer-disks 35 are countersunk within their peripheries at opposite sides, the carbon disks 34 resting in the recesses formed. By this construction a much larger proportionate area of depolarizing material is secured, thereby greatly increasing the efficiency of the battery. Furthermore, the thickness of the depolarizing material in a direct line between the carbon disks and the positive element is much less than in any construction heretofore used providing the same proportionate area of depolarizer, the result being that the resistance to the passage of the current to the carbon disks is diminished, further increasing the efficiency of the battery.

The metallic rod 33 serves not only as a support for the carbon and depolarizer disks, but also strengthens the negative element, which is an advantage.

In Figs. 5, 6, and 7 I have illustrated another form of negative element which may be used in my improved cell instead of that last described, although it is not as efficient as the other. In this form instead of using carbon and depolarizer disks a central carbon rod 38 is used, through which passes the metal rod 33. Around the carbon rod is a depolarizer consisting of two sections 39, of depolarizing material. The ends of the element are caps 40 41, which hold the parts in place, being secured by nuts 42 upon the rod 33.

In Figs. 11 and 12 a still further form of negative element is shown, such form consisting of a central carbon rod 43, around which is a cylinder of depolarizing material 44, and inclosing the depolarizing material is a casing 45, of paper or cloth, which is sufficiently porous to prevent crystallization. The ends of the casing are secured by wrapping with twine 46 or other suitable material.

Although the forms of negative elements shown in Figs. 1, 5, and 11 are capable of use in my improved battery, yet they are not as efficient and do not contain many of the advantages derived from the construction shown in Fig. 4, and therefore the latter construction is preferred.

That which I claim as my invention, and desire to secure by Letters Patent, is—

1. In an electric battery, the combination with a retaining vessel, positive and negative elements, and an excitant therein, of means for sealing said retaining vessel, a valve 24 having passages 27 and a threaded passage 26

communicating with the passages 27 and with the atmosphere, and a threaded plug fitted in the upper end of said threaded passage, substantially as described, and for the purpose specified.

2. In an electric battery, the combination with a metallic retaining vessel, positive and negative elements, one of said elements being in contact with said retaining vessel but independent thereof, and an excitant, of means for sealing said retaining vessel to prevent the escape of gas, and a valve for the discharge of the gases generated by the action of the battery, said valve being a conductor and connected to the negative element, substantially as described.

3. In an electric battery, the combination with a retaining vessel, positive and negative elements, and an excitant therein, of a cap 23, packing under said cap, valve 24, which is also a conductor, passing through said cap, and connected to one of the battery elements, a passage through said valve, and means for closing said passage, substantially as described.

4. In an electric battery, the combination with a retaining vessel, positive and negative elements, and an excitant therein, of means for sealing said retaining vessel, a valve 24 connected to the negative element and having passages 26 27, said valve being a conductor, and a plug for closing said passages to prevent the escape of gas, substantially as described.

5. The combination with a cell, positive and negative elements and an excitant therein, a valve which is also a conductor arranged in one end of said cell and connected to one of the battery elements, a packing disposed about said valve within the cell, and means for expanding the packing to hold the valve in place and close the cell, substantially as described.

6. The combination with a cell, positive and negative elements, and an excitant therein, of packing for closing said cell, a cap above said packing, a valve which is also a conductor extending through said packing and connected to the negative element, said valve having a shoulder, and means for compressing the packing between the shouldered portion of the valve-body and said cap, whereby the packing may be expanded, substantially as described.

7. In an electric battery, the combination with a retaining vessel having positive and negative elements, and an excitant therein, of a valve 24 having a screw-threaded stem 25, a passage 26 therein, means for closing said passage, a nut 32 screwed upon said stem, a cap 23 fitted into the retaining vessel, and packing between said valve and said cap, substantially as described.

8. A negative element for electric batteries, consisting of a series of electrically-negative disks and disks of depolarizing material arranged alternately, the electrically-negative disks being entirely inclosed in the disks of depolarizing material and means for supporting said disks, substantially as described.

9. A negative element for electric batteries consisting of a series of electrically-negative disks and disks of depolarizing material arranged alternately and in contact with one another, the electrically-negative disks being entirely inclosed in the disks of depolarizing material and means for supporting said disks, substantially as described.

10. The combination, in a negative electrode, of a series of electronegative disks and disks of depolarizing material, the electronegative disks being entirely inclosed in the disks of depolarizing material and a rod extending through and supporting said disks, substantially as described.

11. As an article of manufacture, a disk of depolarizing material countersunk within its periphery, substantially as described.

12. As an article of manufacture, a disk of depolarizing material countersunk within its periphery upon its opposite sides, substantially as described.

13. A negative element for electric batteries, consisting of a series of disks of depolarizing material countersunk within their peripheries upon their opposite sides and superimposed one upon another, and electrically-negative disks seated in said countersunk disks, substantially as described.

14. In an electric battery, the combination with a cell, positive and negative elements, and an excitant therein, of means for hermetically sealing said cell, and a valve connected to one of the elements of the battery for permitting the escape of gas from said cell, said valve being a conductor substantially as described.

15. In an electric battery, the combination with a metallic cell, positive and negative elements therein, one of said elements being in contact with said cell, and an excitant in said cell, of means for hermetically sealing said cell, and a metallic valve for the escape of gas therefrom, said valve forming one of the poles of the battery, substantially as described.

MILTON M. KOHN.

Witnesses:
JOHN L. JACKSON,
A. H. ADAMS.

182

T. W. BYRNE.

PRIMARY BATTERY.

APPLICATION FILED DEC. 24, 1908.

946,009. Patented Jan. 11, 1910

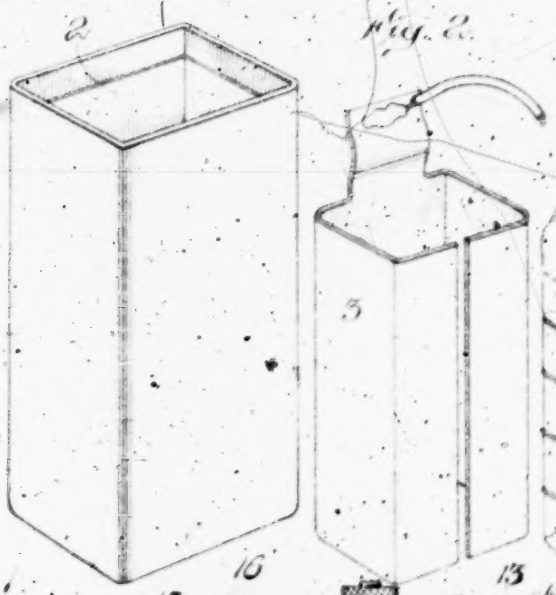



Fig. 2.

Fig. 3.

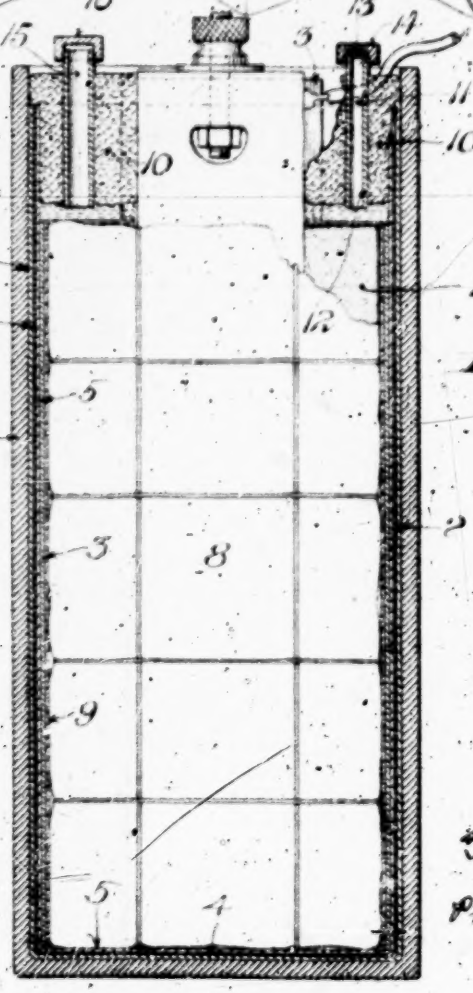



Fig. 1.

Witnesses:
E. C. Burdeman
A. C. Richardson

Inventor
Thomas W. Byrne
by
Phillips, Brown & Paul
Attys.

# UNITED STATES PATENT OFFICE.

THOMAS W. BYRNE, OF BOSTON, MASSACHUSETTS.

## PRIMARY BATTERY.

946,009. Specification of Letters Patent. Patented Jan. 11, 1910.

Application filed December 24, 1908. Serial No. 469,118.

*To all whom it may concern:*

Be it known that I, THOMAS W. BYRNE, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Primary Batteries; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to primary batteries, and more particularly to batteries in which carbon and zinc form the elements, and a solution of ammonium chlorid or of some similar salt is used as the exciting fluid.

The object of the present invention is to produce a battery of the above type which shall be efficient in operation, which shall suffer little, if any, deterioration while standing idle, which may be constructed at small expense, and which may be subjected to rough handling with little liability of damage.

To the above ends the present invention consists in the battery hereinafter described and more particularly defined in the claims.

In the accompanying sheet of drawings the present invention is illustrated as embodied in a wet battery, Figure 1 showing in perspective the container or receptacle; Fig. 2 is a perspective view of the zinc element, and Fig. 3 a perspective of the carbon element surrounded by the depolarizing material; Fig. 4 shows the cell complete in vertical section.

The container for the battery comprises a rectangular box or casing 1 which is preferably made from pasteboard, fiber, or similar material, and in order to render the container waterproof an inner lining 2 of zinc is provided. This zinc lining is preferably made of thin sheet zinc in box form with soldered joints and of such size that it will just slip into the inside of the casing 1. The container thus formed is absolutely waterproof, owing to the water-tight zinc lining, and at the same time may be subjected to rough handling without serious damage, the outer casing stiffening and protecting the zinc lining from injury or wear, and both casing and lining yielding or bending under extreme pressure without danger of fracture or other damage. In order to prevent the [illegible] of the container from being conducted during the operation of the battery, it is necessary to insulate it from the zinc element 3 which fits closely within the lining, and this may be accomplished by a coating of asphaltum paint or some similar substance which is applied to the inside of the lining. The zinc element 3 which is in sheet form and well amalgamated is next inserted in the container, and is preferably further insulated from the inner zinc lining 2 by a waxed paper 3 at the bottom as well as at the sides. The carbon element consists of a piece of stick carbon 6, surrounded, except at its upper end, by the usual depolarizing material 7, which may consist of manganese dioxid and powdered graphite intimately mixed and held around the carbon 6 by means of a bag 8. Blotting paper 9 or similar absorptive material is preferably wrapped around the carbon element which is then inserted in the zinc element, after which the active solution is poured into the cell. A saturated solution of sal-ammoniac or ammonium chlorid may be used for this purpose. The top of the cell is sealed with some suitable material 10 such as pitch or asphaltum to prevent loss of active solution by spilling or evaporation. Preferably a vent 11 is provided by means of the pipe 12 which passes through the seal, and through which any gas which may be formed will escape. The upper end of this pipe 12 is threaded and its open end covered by a leather washer 13 held in place by a screw threaded cap 14 having a central aperture 15. The leather washer is sufficiently porous to permit the escape of gas if any substantial amount should collect beneath the cap, thus preventing injurious internal pressure within the cell. At the same time the washer is sufficiently impervious to prevent the solution from flowing out freely even if the cell should be accidentally tipped over. The cell is also preferably provided with a filling tube 15 closed by the tightly fitting stopper 16 which may be removed to enable a user to renew or replenish the active solution if necessary.

The above described construction possesses many advantages over the batteries of this type now known in the art. Owing to the large amount of zinc provided and the possibility of replenishing the active solution, the battery may be used for a long time, particularly for open circuit work, the amalgamating of the zinc preventing any substantial deterioration due to local action while

the battery is standing idle. Not only is the present battery as clean as the ordinary dry battery but as evaporation and accidental spilling are prevented it will require no more care. All danger of the fracture or leaking of the container from rough handling is practically prevented. Since the inner lining of the container is of zinc, which is the same metal as the element in close proximity to it, no electrolytic action will be set up between the lining and the zinc element if by any chance the two should be brought into mechanical contact. Moreover, this zinc lining is unaffected by the active solution except where impurities in various portions of the lining cause a local action. By coating the lining with asphaltum paint which is the preferred construction of the present invention, the possibility of such local action is reduced to a minimum and can occur only because the paint coating is not entirely waterproof or is injured in some way during manufacture or use.

While the battery shown in the drawings, and above described, is a wet battery, it is obvious that the electrolyte or active solution could be made in the form of a paste or semiliquid, thus making the battery a so-called dry battery.

Having thus described the present invention, what is claimed is:—

1. A primary battery comprising a container, consisting of a pasteboard case provided with an impervious zinc lining, a coating of insulating paint on the inside of the zinc lining, a zinc element within the container, insulating sheet material between the zinc element and the zinc lining, a carbon element surrounded with depolarizing material and within the zinc element, absorptive material between the zinc element and the depolarizing material, an active solution, and a seal closing the top of the container, substantially as described.

2. A primary battery comprising a container consisting of a casing provided with an impervious zinc lining, a zinc element, within the container, insulating material to permanently insulate the zinc element from the zinc lining, a carbon element within the container, an electrolyte and a seal closing the top of the container, substantially as described.

3. A primary battery comprising a container consisting of a zinc lined casing, a continuous insulating coating for the zinc lining, a zinc element within the container and out of electrical connection with the lining, a carbon element within the zinc element, depolarizing material between the carbon element and the zinc element and an electrolyte, substantially as described.

4. A primary battery comprising a container consisting of a casing provided with an impervious zinc lining, a coating of insulating paint on the inside of the zinc lining, and a zinc element, a carbon element, depolarizing material, and an electrolyte, all within the container, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses.

THOMAS W. BYRNE.

Witnesses:

ALFRED H. HILDRETH,
ANNIE C. RICHARDSON.

186

C. F. BURGESS.

DRY CELL AND BATTERY THEREOF.

APPLICATION FILED MAY 28, 1915.

1,188,408.

Patented June 27, 1916.

Fig. 1.

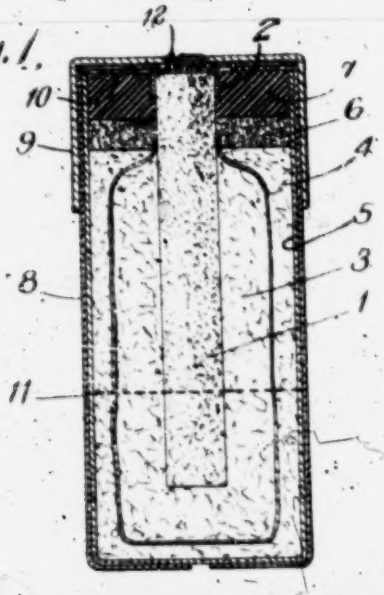



Fig. 2.

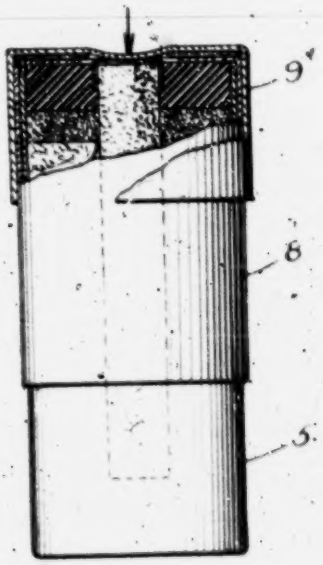



Fig. 3.

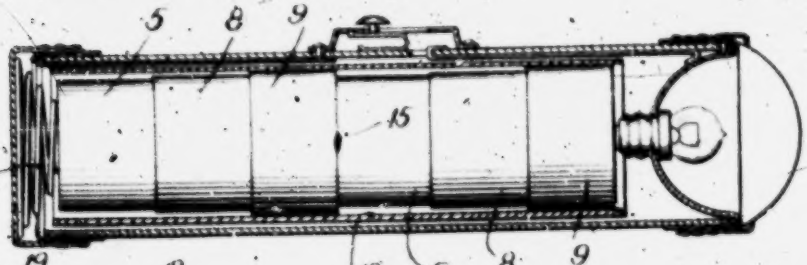



Fig. 4.

Fig. 5.

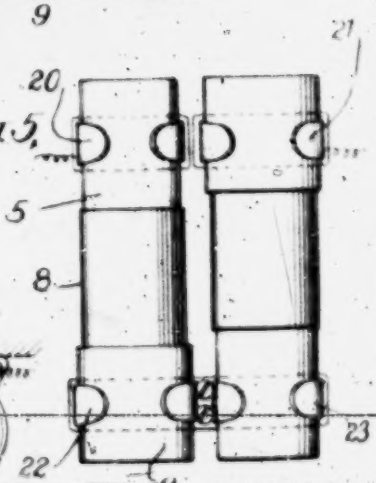



Fig. 6.

INVENTOR

Charles F. Burgess

BY

Pennie Davis Marvin

ATTORNEYS

# UNITED STATES PATENT OFFICE.



CHARLES F. BURGESS, OF MADISON, WISCONSIN, ASSIGNOR TO C. F. BURGESS LABORATORIES, A CORPORATION OF WISCONSIN.

## DRY CELL AND BATTERY THEREOF.

1,188,108. Specification of Letters Patent. Patented June 27, 1916.

Application filed May 28, 1915. Serial No. 30,963.

*To all whom it may concern:*

Be it known that I, CHARLES F. BURGESS, a citizen of the United States, residing in Madison, county of Dane, State of Wisconsin, have invented certain new and useful Improvements in Dry Cells and Batteries Thereof; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to dry cells suitable for use in flash lights and battery hand lamps, and relates more particularly to adjuncts whereby the cells are protected from mechanical injury, and are safeguarded in many ways, and whereby the danger of short circuiting is lessened and a convenient and effective grouping of the cells into batteries is made possible.

In dry cells as ordinarily constructed, the carbon or electronegative electrode extends up through a pitch seal at the top of the cell, and carries a brass cap to which electrical connection may be made either by pressure contact or by soldering. This is a fragile construction because the carbon rod is itself relatively weak, and the pitch seal is brittle and easily broken, resulting in leakage of the electrolyte or drying out of the active battery material. It sometimes happens that when the cells are dropped or otherwise abused, the carbon electrode will be forced down through the pitch seal, thereby destroying the effectiveness of the seal and otherwise impairing the cell. This may happen when the cell is used in a hand lamp and is squeezed too tightly between the base of the lamp bulb and the screw cap with which such devices are commonly provided. There is also a tendency for the seal to be pushed upward because of the generating of gases in the cell while in [illegible] or when on the shelf, and such a movement of the pitch seal will permit leakage of the electrolyte or creepage of salts, and eventually will result in early destruction of the cell.

It is the object of the present invention to provide a cell in which the causes of failure above set forth are in large measure removed, and in which various other advantages are insured, more particularly with reference to convenience in handling and in assembly into groups or batteries.

To attain these objects, I make use of a metal collar or cap slipped on over the zinc electrode of the cell but insulated therefrom, and I arrange this cap so that connection may be made therethrough to the carbon or electronegative element of the cell, as hereinafter explained more at length. This arrangement protects the pitch seal, insures good connection with the carbon electrode, facilitates assembly, and is in many ways advantageous as hereinafter set forth, or apparent to those skilled in this art.

In the accompanying drawings, Figure 1 is a sectional elevation through a cell provided with a metal cap soldered to the terminal of the carbon electrode. Fig. 2 illustrates a modification, wherein the metal cap is not soldered to the carbon terminal but is elastic enough to move into contact therewith under pressure. Fig. 3 shows one way of grouping such cells end to end, as for use in a hand lamp. Fig. 4 shows the cells arranged side by side and connected in series. Fig. 5 shows the cells held in spring clips through which connection is made. Fig. 6 is a top view of the arrangement shown in Fig. 5.

In Fig. 1, the cell comprises a carbon rod 1 provided at its top with a brass cap 2 squeezed on the carbon rod in usual manner to serve as a terminal for contact devices. About the carbon rod is a depolarizing mixture 3 of manganese dioxid rendered conductive by carbon or graphite and mixed with the usual salts. Inclosing the core of depolarizing mixture is the electrolytic paste 4 held in the usual zinc cup 5, which serves not only as the electropositive electrode of the cell, but also as a container for the other elements. Above the electrolyte paste 4 is an air space or porous separator 6 to take care of gases developed in the cell, and above this is the usual pitch seal 7, the top of which may be substantially flush with the edge of the zinc electrode, with the brass cap 2 projecting slightly above the pitch. The foregoing elements may vary in detail, but it is with cells of this general character that my invention has been used to best advantage.

In accordance with the present invention, I inclose a part or all of the zinc container in a wrapping 8 of paper, or equivalent insulating material, and over this wrapping I slip a metal cap 9. This metal cap may be

of thin sheet brass shaped in the form of a cup, and preferably is of such size that when forced over the top of the cell it will frictionally engage the paper wrapping and grip it tightly. I prefer that the paper wrapping shall be folded in over the edge of the zinc container or electrode, about as shown in Fig. 1, so that the edge of the zinc or irregularities thereon may not come into contact with the brass cap. Preferably, a paraffined paper washer, 10, or equivalent insulating material, lines the cup to assist in preventing short-circuit or leakage to the cap. The paper wrapping may extend down the entire length of the zinc container and may be folded over or crimped to cover up the bottom of the can, though it is often desirable to perforate the paper at about the dotted line 11 so that the lower portion of the wrapping may be stripped off to give access to the zinc beneath.

In the modification shown in Fig. 1, there is a hole through the cap 9 at its center through which a drop of solder 12 may be introduced to permanently connect the cap to the carbon electrode.

With the arrangment above described, the cells can be handled in the factory without the same danger of short-circuiting as is found with ordinary types of cells. The paper wrapping 8 may be waterproofed before being applied to the zinc, but I prefer to waterproof it after the device has been completely assembled, as above described, for in that condition the complete cell can be dipped into melted paraffin, thereby not only making the entire paper wrapping waterproof and increasing its insulating characteristics, but also giving to the metal cap 9 a thin coating advantageous in preventing tarnishing and similar deterioration. The dipping in hot paraffin has a tendency to soften the pitch seal 7 because of the heat, but this is advantageous rather than otherwise, for if the pitch melts or softens sufficiently, it will become attached to the adjacent paper and thereby stiffen and strengthen the seal as a whole. The hot paraffin runs up by capillarity under cap 9, and at a proper temperature a thorough impregnation of the paper and a thorough coating of the entire cell is possible. This cannot be done with the ordinary cell because of the danger of softening or melting the pitch seal.

Although the metal cap is held in place mainly by the frictional hold it has on the paper covering 8, it is not so tightly held but that it will yield to some extent if for any reason the pressure inside the cell should become too high. It can move upward a little to relieve excess pressure without moving the carbon rod because the cap is thin and somewhat flexible; but whether the carbon rod does or does not move when the excess pressure forces the cap upward, the cell does not become unsealed in a practical sense, for the electrolyte cannot escape and substantial evaporation cannot occur. In other words, the volume of the cell may increase in an emergency and the cell will remain in good condition, and be able to continue in use for substantially its normal life.

The waterproofed paper wrapping, particularly if it covers substantially the entire surface of the zinc container, prevents leakage of the cell contents when the zinc has become perforated or corroded either because of normal use or because of some imperfection in the cell permitting local action, and the paper thereby prevents corrosion of the metal casing in which such cells are often used, and also prevents evaporation and drying out of the cell, and is of value in the factory while the cells are being handled or assembled into batteries or are in storage. It is easy to solder an electrical connection to the metal cap 9, easier than if the connection were to be made to the terminal cap 2, and the cap 9 covers up the pitch and holds it and the other sealing compound in place. Electrical connection can be made to the zinc, as through a perforation in the paper wrapping, or by soldering to the zinc after locally stripping off the paper. By stripping away the paper wrapping below the line 11 of perforation, as when the cells are to be assembled into batteries, the lower part of the zinc shell becomes exposed, as shown in Fig. 2, and is available for completing connections to the cell.

In the modification illustrated in Fig. 2, wherein the parts are numbered to correspond with Fig. 1, the metal cap 9', though it may have a central hole, has no soldered connection with the carbon rod, but is crowded on to the cell only far enough to bring it close to the rod cap 2, but without touching. By making the cap of thin material, as of sheet brass, the flexibility of the metal will permit it to move down under end pressure, applied as indicated by the arrow, into contact with cap 2, and therefore into electrical connection with the carbon rod. This connection may be permanent or but temporary, depending on the flexibility and thickness of cap 9' and the uses to which the cell is to be put.

In assembling into batteries the cell illustrated in Fig. 2, or the cell of Fig. 1, after stripping away the paper below line 11, I may place them end to end, as shown in Fig. 3, or side by side, as shown in Fig. 4. In using them end to end, as shown in Fig. 3, particularly when using them in a hand lamp of the general character disclosed in that figure, I prefer to inclose the cells in a tube 13 of pasteboard or the like. The

thrust of spring 14 in the bottom of the hand lamp maintains connection throughout the series, whether two or more cells are used, but I prefer to solder the zinc of one cell to the metal cap 9 of the next, as indicated at 15, for this reduces the contact resistance between the cells and overcomes the danger of open-circuiting through corrosion, and in dealing with the small voltages here under consideration, these are important factors in the efficient operation of the hand lamp.

When the cells are to be arranged side by side for series connection, I arrange the exposed zinc bottom of one cell adjacent to the metal cap of the next, and I connect the zinc to the cap either by simple contact or by means of a drop of solder 16 applied to their adjacent sides, or I may use other special means for connecting, as explained hereinafter in connection with Figs. 5 and 6. With this arrangement, as shown in Fig. 4, an L-shaped metal strip 17 may be soldered to one metal cap and a yielding metal strip 18 of usual form may be soldered to the exposed zinc bottom of the cell next adjacent, and a thin strip 19 of fiber or the like may be inserted between the upper portions of the two cells to prevent them from making contact and thus short-circuiting, and the battery thus assembled may be placed in a suitable container or carton and is ready for use in the well known type of electric flash light.

In the arrangement shown in Figs. 5 and 6, the cells are slipped into spring clips such as are used for holding fuses. The upper metal clips 20 and 21 may be connected with the circuit to be supplied with current from the battery; and the lower clips 22 and 23 may be connected together to form a cross-connection, it being understood that these clips are permanently mounted on some sort of a supporting wall indicated diagrammatically in Fig. 6. The cell inserted between clips 20 and 22 has its naked zinc bottom 5 contacting with clips 20, and its metal shell 9 contacting with clips 22, and the adjacent cell has the reverse arrangement so that the cells may act in series. It will be understood that any desired number of cells can thus be arranged side by side in series connection to give a battery of the desired voltage. In case any cell becomes impaired or exhausted, it can be slipped out of its clips and replaced by a fresh cell, and there is no occasion for making or breaking any soldered connections, and the arrangement as a whole is very convenient and has many advantages, as will be understood by those skilled in the art.

I claim:

1. A dry battery cell having a zinc element, and a metal cap which is slipped over said zinc element and permanently insulated therefrom and through which connection may be established with the carbon or electro-negative element of the cell, substantially as described.

2. A dry battery cell having a zinc element, and a metal cap slipped over said element and permanently insulated therefrom, said cap being electrically connected with the carbon element, substantially as described.

3. A dry battery cell having a zinc element, a metal cap slipped over said element and permanently insulated therefrom and means connecting said cap with the carbon element of the cell.

4. A dry battery cell having a perforate metal cap slipped over and insulated from the zinc element and a soldered connection between said cap and the terminal of the carbon element of the cell.

5. A dry battery cell having a zinc electrode with an end portion permanently insulated, a metal cap inclosing said insulated end portion of the zinc electrode, said cap being held from free longitudinal movement by frictional engagement with said insulated end portion and establishing electrical connection with the carbon electrode, substantially as described.

6. The combination of a dry cell, an insulating covering for a part at least of the zinc element of said cell, a metal cap snugly fitting over said insulation, said cap making electrical connection with the carbon or electronegative element of said cell and serving as a cell terminal.

7. The combination of a dry cell, an insulating covering for a part only of the zinc element of said cell, a metal cap tightly fitting over said insulation and electrically connected with the carbon element of said cell, a portion of said zinc electrode outside of said cap being exposed for electrical contact.

8. The combination of a dry cell, a paper wrapping about the upper part at least of the zinc electrode, a metal cap covering the top of said cell and tightly engaging said paper wrapping, said cap at its center being soldered to the terminal of the carbon electrode of said cell.

9. The combination of a dry cell, a paper wrapping about the upper part of the zinc electrode, said wrapping overlapping the edge of the zinc, a metal cap covering the seal of the cell and tightly gripping said wrapping, said cap having a central perforation, and solder in said perforation, electrically connecting the cap to the terminal of the carbon electrode, substantially as described.

10. A battery comprising a plurality of dry cells each having a metal cap slipped over and insulated from the zinc element but connected to the carbon element, the

cells being connected in series with the metal cap of one cell adjacent to and electrically connected with the other end of the next cell.

11. A battery comprising a plurality of dry cells each having a metal cap inclosing one end of the cell and insulated from the zinc element but connected with the carbon element, the cells being connected in series with the metal cap of one cell contacting with an exposed portion of the zinc electrode of an adjacent cell; substantially as described.

12. A battery comprising a plurality of dry cells each having a metal cap inclosing one end of the cell and insulated from the zinc element but connected with the carbon element, the cells being arranged in series with the metal cap of one cell soldered to the zinc element of the next cell.

13. A battery comprising a plurality of dry cells each having a metal cap slipped over and insulated from the zinc element but connected to the carbon element, the cells being arranged side by side and connected in series with the metal cap of one cell adjacent to and electrically connected with the other end of the next cell.

14. A battery comprising a plurality of dry cells each having a metal cap inclosing one end of the cell and insulated from the zinc element but connected with the carbon element, the cells being arranged side by side and connected in series with the metal cap of one cell contacting directly with an exposed portion of the zinc electrode of an adjacent cell.

15. A battery comprising a plurality of dry cells each having a metal cap inclosing one end of the cell and insulated from the zinc element but connected with the carbon element, the cells being arranged side by side and connected in series with the metal cap of one cell soldered to the zinc element of the next cell.

16. A battery comprising a plurality of dry cells each having a metal cap slipped over and insulated from the zinc element but connected with the carbon element, said cells being connected in series with the metal cap of one cell adjacent to and electrically connected with the other end of the next cell, a battery terminal attached to the metal cap at one end of the series of cells, the other terminal of the battery being connected to the zinc electrode at the opposite end of the series.

In testimony whereof I affix my signature.

CHARLES F. BURGESS.

192.

J. E. DUNN.

ELECTRIC BATTERY.

APPLICATION FILED NOV. 29, 1916.

1,233,204.

Patented July 10, 1917.

Fig. 1.

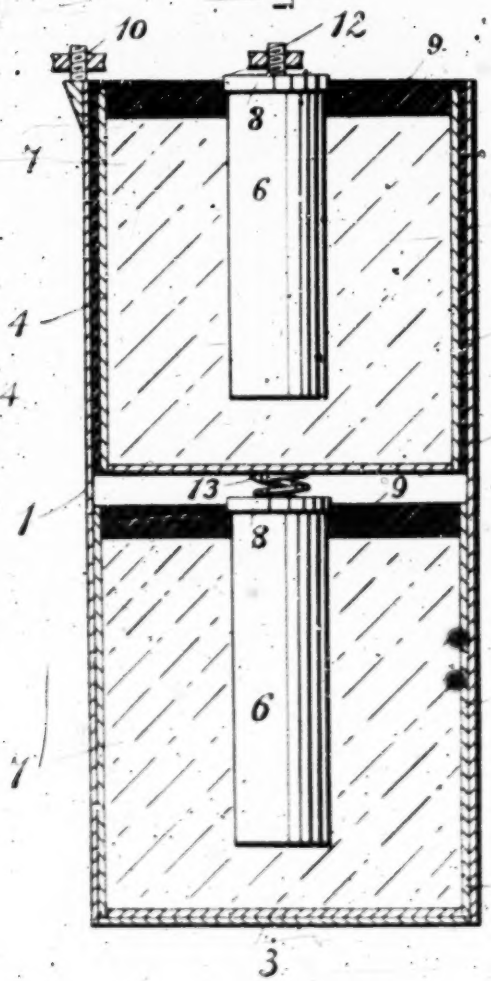



Fig 2.

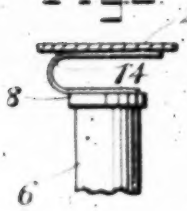



Fig 3.

Inventor:
JAY E. DUNN.

By Attorney
William F. Nickel

# UNITED STATES PATENT OFFICE. 193

JAY E. DUNN, OF BROOKLYN, NEW YORK, ASSIGNOR TO NOVO MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## ELECTRIC BATTERY.

1,233,204. Specification of Letters Patent. Patented July 10, 1917.

Application filed November 29, 1916. Serial No. 134,077.

*To all whom it may concern:*

Be it known that I, JAY E. DUNN, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Electric Batteries, of which the following is a specification.

My invention relates to an improvement in primary electric batteries; particularly batteries of the type comprising several cells disposed in a suitable container and connected in the required manner.

It is the principal object of my invention to provide a battery of the kind just mentioned having a container so constructed as to be strong, durable and impervious to moisture, easy and inexpensive to manufacture, and capable of receiving two or more cells and permitting them to be electrically connected in the simplest possible way to achieve the desired result.

Other objects and advantages of my invention will appear from the following description, taken with the accompanying drawings; and the characteristics of my invention will be pointed out in the subjoined claims. The embodiment of my invention herein shown, however, is to be understood as illustrative only; and I reserve the right to vary the structural details thereof in accordance with the scope and spirit of my invention as the same is defined by the terms in which the claims are expressed.

On the drawings:

Figure 1 represents a longitudinal section of an electric battery made according to the principle of my invention; and

Figs. 2 and 3 show details.

The same numerals of reference identify the same parts throughout.

My improved battery includes a container 1, which is preferably of some good electrically conductive material, such as tin; and which consists of a body 2 and bottom 3. The body is made by rolling a plate into the form of a cylinder and soldering the edges to each other; and then soldering one end of the body to the bottom; in order to join these two parts together. When completed, the outer surface of the container may be given a coating of varnish or enamel; but the inside surface is left uncovered so that it may come into direct contact with the casing 4 of one of the cells 5 which are disposed in the container 1.

Each of these cells 5 comprises a casing that is a counterpart of the container 1; that is, it is made of a plate of conductive metal, such as zinc, rolled into a cylinder and soldered at its edges, to provide a body; and a bottom of the same metal; the body and bottom of the casing being joined to each other by soldering in the same way as the body 2 and bottom 3. This casing 4 serves as one pole or electrode of the cell; and holds the chemical ingredients by the action of which the electric current is generated. The other electrode is afforded by a rod of carbon 6 which is located in the center of each casing and extends down into the ingredients; which are diagrammatically shown and indicated by the numeral 7. These ingredients may be any chemical substances that will serve my purpose; and the nature thereof need not be detailed here, for the reason that the materials employed to act upon the electrodes of the battery do not constitute a part of my invention. The carbon rods 6 project slightly above the tops of the casing 4; and each rod may have a metallic cap 8; and the top of each cell may receive a layer of suitable insulating compound 9; such as sealing wax, which surrounds the carbon rod and serves as a cover to seal the cell and protect the contents of the same.

The lowermost cell 5 only has the outer surface of its casing 4 in electrical contact with the inside surface of the container 1; and the container has secured thereto near its upper edge a binding post 10; which is in fact one of the terminals of the battery. The cell above the lowermost cell is wrapped with a suitable insulating substance, such as paraffin paper, oiled silk, etc., indicated by the numeral 11; whereby the outside surface of the casing 4 of the cell in question may be kept out of contact with the container 1. To the cap 8 of the carbon rod 6 of this cell is affixed another binding post 12, constituting the other battery terminal; and the lowermost cell is placed in electrical connection with the cell above it by soldering to the cap 8 on the carbon rod 6 of the lowermost cell a resilient member, such as a spring 13; which yieldably makes con-

tact with the bottom of the casing 4 of the cell above it. The rod 6 of the lowermost cell of course projects up far enough to keep the casings 4 of the two cells from coming together and touching; and the spring 13 will insure the maintenance of a good contact between the zinc casing of the upper cell and the carbon electrode of the lower. If the two casings should be placed relatively close together, the spring 13 will yield and the connection between the two cells be preserved; while if the two cells be relatively far apart, this spring will expand with the same result.

The two cells 5 will therefore be in series, and when the posts 10 and 12 are joined to an outside circuit, current will of course flow out of the cells 5. If more than two cells are employed, they will be disposed in the container in the same way; with only the casing of the lowermost in contact with the container, and the casings of all the rest will be wrapped with paraffin paper, oiled silk, etc., to prevent contact with the container. The cap 8 on the carbon electrode 6 of each cell but the uppermost will have a spring secured thereto for the purpose of making loose and yieldable contact with the casing of the cell next above it, to establish and preserve the series arrangement.

With a battery constructed as set forth above, a very practical construction is obtained, and at a comparatively low cost. The container and the cells can be very easily and quickly made and assembled; and when the battery is finished, it is both waterproof and strong enough not to be at all liable to suffer damage under ordinary conditions of use. It is constituted of relatively few parts; and the design is such that the connections between the lowermost cell and the container and the remaining cells can be established by the simple operation of putting the cells into the container; and therefore in the easiest way that can be devised. Hence the battery cannot get out of order; and will continue to give satisfactory service until the ingredients are exhausted by the natural chemical reactions which they undergo through their contact with the carbon and zinc electrodes of the cells 5.

In the lower cell 5, the insulation 9 engages the cell only, and not the container, to seal the cell; but the insulation in the top of the upper cell seals not only this cell, but the container also. For this purpose the insulation 9 of the upper cell 5 extends over the top rim thereof and over the insulating layers 11 between this cell and the container, to the body 2 of the container 1; closing the latter and making it both leakproof and impervious to moisture from without; and at the same time holding the cells in the container.

The spring 13, which is a spiral spring, may be replaced by a U-shaped spring, soldered at one end to the cap 8 of the rod 6 of the lower cell 5, as indicated at 14, in Fig. 2. The free end of this spring will loosely and yieldably engage the zinc bottom of the upper cell in the same way as the end of the coiled spring 13. I may also attach a threaded stem 15 to the cap 8 of the rod 6 of the lower cell 5 and solder a metal block 16 having a threaded bore to the zinc bottom of the upper cell, as shown in Fig. 3. When the upper cell is put into the container, it is turned to screw the block on the stem 15.

In practice, the lower cell is slightly larger than the upper. The lower cell must fit the container tightly and may be pressed in; while the upper is made small enough to give room for the insulation 11.

If desired, the container 1, when the battery is finished, may be inclosed in a paper cover or carton.

Of course, the body 2, after being rolled, may have its edges clenched together, instead of soldered; and may be clenched to the bottom 3; and the cells 5 may be made in the same manner.

Having described my invention, what I believe to be new, and desire to secure and protect by Letters Patent of the United States, is as follows:

1. A battery comprising a container of electrically conductive material, a plurality of cells in said container, one of said cells having a casing of conductive material in electrical contact with said container, and insulation for sealing the container, one of said cells having a terminal projecting through said insulation.

2. A battery comprising a container of electrically conductive material, a plurality of cells in said container, said cells each having a casing of electrically conductive material, one of said cells having its casing in electrical contact with the container, and the remainder of said cells having their casings insulated from the container, and insulation for sealing the container, one of said cells having a terminal projecting through said insulation.

3. A battery comprising a container, including a body and a bottom of electrically conductive material, a plurality of cells arranged end to end in said container, one of said cells having a casing of electrically conductive material in electrical contact with the bottom and body of said container, and insulation for sealing the container, one of said cells having a terminal projecting through said insulation.

4. A battery comprising a container, including a body and a bottom of electrically conductive material, a plurality of cells arranged end to end in said container, said

cells each having a casing of electrically conductive material, one of said cells having its casing in electrical contact with the bottom and body of the container, and the remainder of said cells having their casings insulated from the container, and insulation for sealing the container, one of said cells having a terminal projecting through said insulation.

In testimony whereof, I have signed my name to this specification this 21st day of November, 1916.

JAY E. DUNN.

E. ARMELIN.

CONNECTION WITH DRY BATTERIES.

APPLICATION FILED SEPT. 14, 1918.

198

1,299,813.

Patented Apr. 8, 1919.

Fig 1

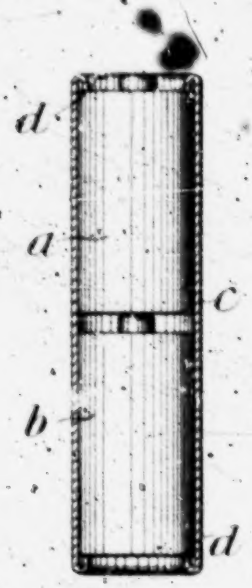



Fig 2

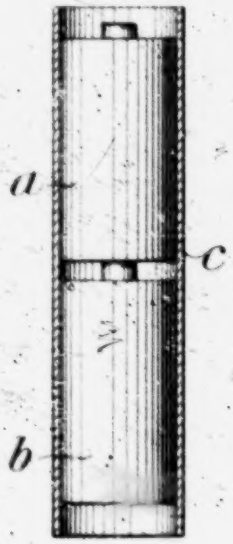



Fig 3

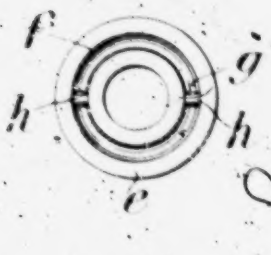
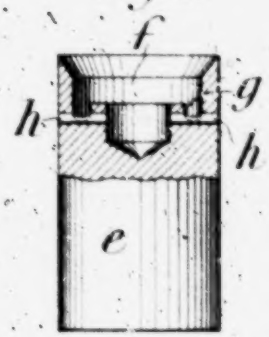



Fig 4




Witnesses

D. F. Moore

Inventor

Edouard Armelin

By Whitaker & Prevost

Attys.

# UNITED STATES PATENT OFFICE.

EDOUARD ARMELIN, OF SOUTH WOODFORD, ENGLAND.

## CONNECTION WITH DRY BATTERIES.

1,299,813. Specification of Letters Patent. Patented Apr. 8, 1919.

Application filed September 14, 1918. Serial No. 254,114.

*To all whom it may concern:*

Be it known that I, EDOUARD ARMELIN, a citizen of the Republic of France, residing at "Clovelly," The Shrubberies, South Woodford, Essex, England, have invented new and useful Improvements in or in Connection with Dry Batteries, of which the following is a specification.

My invention relates to dry batteries and to that class of battery, such as is employed in connection with electric torches and the like, and comprising two or more cells which are connected together in series in a paper or like case or cartridge.

In such batteries as heretofore made, the usual practice is to place the two or more cells composing a battery, loosely in the paper cartridge or case, the ends of which are left open, the result being that there is a liability of the cells falling out of the case or cartridge, and of becoming separated from one another thereby breaking the electrical connection between them. In some cases to obviate this defect the adjacent terminals of the individual cells are permanently connected by means of a piece of flexible wire, but this construction is expensive, requires skilled labor and is not altogether satisfactory.

Now, according to my invention, the object of which is to provide simple and efficient means for obviating the above described difficulties, I insert the two or more cells loosely in the paper or like case or cartridge, which is made of such a length, that it projects somewhat from either end of the inserted cells, the projecting ends being then turned over, so as to form at each extremity an internal shoulder or flange which bears against the end of the cells and securely retains the latter within the cartridge.

Any suitable means may be made use of for turning or spinning over the projecting ends of the case or cartridge; for example, I may introduce the end into a tubular tool having one or more radially arranged pins against which the end of the cartridge bears, the tool and cartridge being then caused to rotate relatively to one another, so that the end of the latter is turned or spun over when applied against the pin or pins.

To enable my invention to be fully understood I will describe it by reference to the accompanying drawing, in which:

Figure 1 is a sectional elevation of a battery construction according to my invention.

Fig. 2 is a view similar to Fig. 1 but showing the cartridge before the ends are turned or spun over.

Fig. 3 is a plan view of a convenient tool for spinning over the ends of the case; and

Fig. 4 is a sectional elevation thereof.

*a* and *b* indicate the two dry cells which constitute the battery, and *c* is the paper or like case or cartridge into which the two said cells *a* and *b* are introduced, with their opposing terminals in electrical contact. The case or cartridge *c* is of such a length that its ends project beyond the extreme ends of the pair of dry cells, as clearly shown in Fig. 2, and these ends of the case are turned or spun over so as to form internal shoulders or flanges *d*, Fig. 1, which bear against the outer ends of the cells *a*, *b* and securely retain the latter within the case.

As above stated, any suitable apparatus or means may be employed for spinning or turning over the ends of the case, and a convenient tool for the purpose is illustrated in Figs. 3 and 4. This tool comprises a cylindrical shank *e* one end of which is hollow, so as to form a tubular recess *f* with an annular groove *g* at its bottom. Extending radially through the annular groove *g* are two pins *h*. The tool is employed as follows, that is to say, it is fixed in a lathe such that it can be rotated and the end of the case *c* is inserted into the recess *f* which is of a diameter to receive it, its extremity extending into the annular groove *g*. If, now, the case *c* be pressed against the radial rotating pins *h*, the latter will turn or spin over the end thereof in the manner above described.

By my invention not only is the appearance of the finished article enhanced, but the durability and lasting power of the cells is also increased, particularly in cases

where the spinning operation is effected under heat or the ends of the proper cartridge or case have ben previously treated with paraffin wax or the like, as the said spinning operation hermetically seals the battery.

Claim:

A dry battery comprising a tubular casing having open ends, and a plurality of cells located in said casing, the casing having its tubular extremities bent inwardly to form shoulders which engage opposite ends of two cells and maintain the cells in electrical contact.

EDOUARD ARMELIN.

202 Dec. 21, 1926. 1,611,153

R. C. BENNER ET AL

DRY CELL AND PROCESS OF MAKING THE SAME

Filed Nov. 21, 1923

Fig. 1.

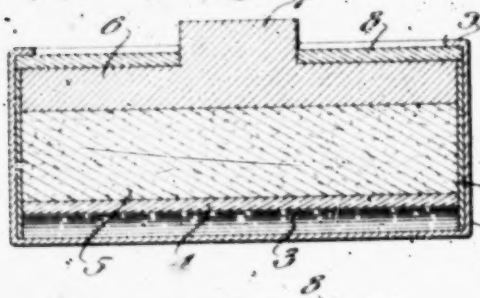



Fig. 3.

Fig. 2.

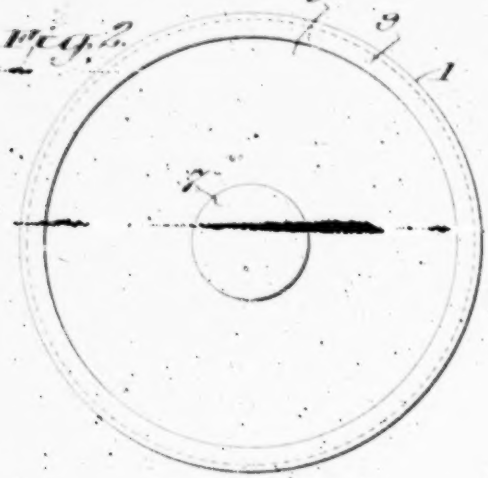



Fig. 4.

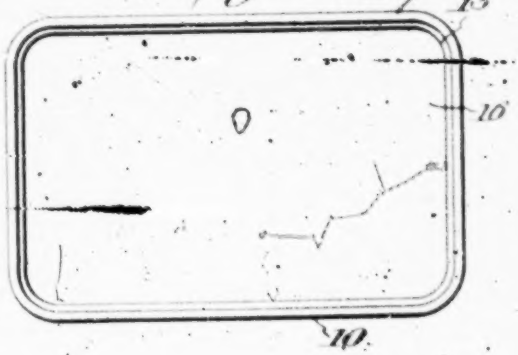



Fig. 5.

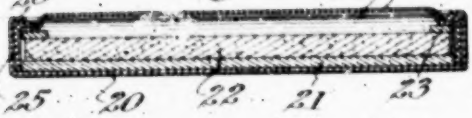



Fig. 6.

Inventors

Raymond C. Benner

Homer W. Jones

By Byrne Townsend & Buckenstein

Attorneys

Patented Dec. 21, 1926. 1,611,153

# UNITED STATES PATENT OFFICE.

RAYMOND C. BENNER, OF BAYSIDE, AND HOMER W. JONES, OF FLUSHING, NEW YORK, ASSIGNORS TO NATIONAL CARBON COMPANY, INC., A CORPORATION OF NEW YORK.

## DRY CELL AND PROCESS OF MAKING THE SAME.

Application filed November 21, 1923. Serial No. 676,137.

This invention relates to dry cells of the flat type embodying a shallow container which forms one electrode of the cell. A principal object of the invention is to provide improved and simplified means for holding the parts of the cell together, preferably under compression.

Various forms of cells constructed as indicated generally above have heretofore been devised. These cells ordinarily comprise separate elements adapted to cooperate with the container electrode in retaining the other parts of the cell. Such elements may be a top fitting upon the container electrode, a wrapping of fabric, an incrustation of a plastic, such as celluloid, and other special securing means. Frequently separate provision is made for placing the cell under compression, by screws, wedges, or equivalent devices.

In accordance with our invention, the advantages of the type of cells referred to are obtained with marked simplification of structure by utilizing an inturned portion of the wall of the container electrode to hold the assembly together. In a preferred form, the wall of the container electrode is crimped inwardly at its upper margin upon an insulated portion of a plane electrode of opposite polarity, which forms a closure for the container.

The invention will be described in detail in connection with the accompanying drawings, in which—

Fig. 1 is a vertical section through a cell having the improved closure;

Fig. 2 is a top plan view of the cell;

Fig. 3 is a vertical section through a modified form of cell;

Fig. 4 is a top plan view of the same;

Fig. 5 is a vertical section through a cell similar to that shown in Fig. 3, but having the position of the electrodes reversed; and

Fig. 6 is a view similar to Fig. 5, showing a modified form of insulating means.

Referring to Figs. 1 and 2, reference numeral 1 denotes a cylindrical zinc cup lined with bibulous paper 2, or the like, and containing a layer 3 of electrolyte paste upon its bottom. A disc 4 of suitable material, such as pulp board, separates the electrolyte paste from depolarizing mix 5. A carbon plate 6, preferably having a protruding portion 7, rests upon the mix. An insulating collar 8, impervious to electrolyte, is fitted over the portion 7 and extends to the circumference of the cell.

To secure the parts in position, the rim of the zinc cup is turned inwardly upon the insulating collar 8, forming a retaining flange 9. The collar should be made of material capable of resisting the compressive force applied. Tough fiber board impregnated with paraffin is a suitable material. The cell should be compressed to secure the most efficient contact between the reactive elements, and the flange 9 should be formed while the cell is so compressed. In this way the desired degree of contact will be permanently maintained.

In the cell shown in Figs. 3 and 4, the means for securing the parts is essentially the same as that previously described, but the cell arrangement is modified. The zinc container electrode 10 is formed with a shoulder 11 extending inwardly from its walls and bounding a paste receptacle 12 in the container bottom. An electrolyte-proof insulating lining 13 conforms to the container wall 14 and overlies the shoulder 11. A coherent block of depolarizer 15 rests upon the lining of the shoulder. A "duplex" electrode, consisting of a metal plate 16 with a conductive carbonaceous coating 17, is placed upon the depolarizer, the coating 17 being in contact therewith.

The upper portion 18 of wall 14 is turned inwardly and presses the lining against the duplex electrode. The lining should extend farther over the duplex electrode than does the crimped portion of the wall. In this way contact between the zincs of adjacent cells is prevented and the cells are properly centered when stacked to make series connection between the duplex electrodes and the zinc containers.

In the form of the invention shown in Fig. 5, a zinc electrode 19 forms the top of the cell. The cathode is a sheet metal container 20 provided with a conductive carbonaceous layer 21 upon its bottom. A depolarizer mass 22 rests upon the layer 21 and is spaced from the zinc electrode 19 by a marginal insulating strip 23. The central area of the zinc electrode is elevated with respect to the margin to provide a chamber for electrolyte paste 24. An insulating strip 25 conforms to the walls of the

container 20 and when these are crimped inwardly, as at 26, the strip spaces the walls from the zinc.

The conductive layer upon the bottom of the container may be extended upwardly on the side walls, replacing the insulating strip 25. This form of cell is illustrated in Fig. 6, wherein 27 denotes a sheet metal container having its bottom and walls lined with an impervious conductive material 28. This should extend to a point adjacent the zinc electrode 19 and is an effectual protection against corrosion of the side walls. Annular insulating strips 30 and 31 are placed below and above the margin of the zinc electrode to space it respectively from the mix 22 and the flange 26. The paste 24 may only partially fill its chamber, leaving room for expansion.

It is preferred to use duplex electrodes, because of their superior conductivity, strength, flexibility, and space economy. They may be made as described in the application of R. C. Benner, Serial No. 534,509, filed February 6, 1922; that is by coating zinc or other sheet metal on one surface with a graphite-containing plastic adapted to harden upon the metal. Other suitable methods may be adopted, such as forcing graphite particles into a plastic applied to the metal, or suspending graphite in a volatile liquid and brushing or spraying the suspension on a metal backing. Paraffin may be used as a binder for the graphite particles.

In some cases juxtaposed plates of carbon and metal are the equivalent of the duplex electrode. Carbon plates alone may be used, as in the cell of Figs. 1 and 2. The carbon plates should generally be rather thick, to guard against breakage.

As an incident to the improved means for securing the cell elements in assembled relation under the proper amount of compression, there is the important advantage of securing an electrolyte-proof seal for the cell. No liquid escapes between the cell cover and the retaining flange formed by the crimped container wall, since the insulating material compressed between these parts forms an impervious packing. The seal is ordinarily hermetic. This is permissible when the cells are to be used in low drain work, as for example in radio B batteries, since there is no large evolution of gas. If the cells are to be subjected to heavy current drain, a gas vent should be provided. This may be formed by making a perforation in the cover, or in other suitable ways. Or a portion of the cell may be left vacant to serve as an expansion chamber, as shown in one form in Fig. 6.

We are aware that insulating covers have been secured to cells by crimping, spinning, or punching the metal of the container electrode to engage the cover. Such constructions are not applicable to cells in which an electrode is used as the closure. The present invention provides a practical way of simultaneously securing, compressing, and sealing the elements of cells of this latter type. The embodiments described are illustrative only, and various modifications may be made within the scope of the appended claims.

We claim:

1. A dry cell comprising a container electrode, electrolyte and depolarizer therein, said container electrode having its walls crimped inwardly at the top, a second electrode forming a closure for the container electrode, and an insulating member conforming to the walls of the container electrode and spacing the crimped portion of the same from the said second electrode, said insulating member also serving to completely space the depolarizer mix from contact with metallic parts of the container.

2. A dry cell having a metallic container serving as one electrode and a closure for the container serving as the other electrode, electrolyte and depolarizer therein, insulating means lining the container and spacing the depolarizer and closure therefrom.

3. A dry cell having a metallic container serving as one electrode and a closure therefor serving as the other electrode, active material therein, and suitable lining means spacing the active material and closure from the container.

4. A dry cell having a metallic container serving as the anode and a closure therefor serving as the cathode, electrolyte and depolarizer therein, a lining for the container spacing the cathode and depolarizer therefrom, and a seal comprising material impervious to electrolyte compressed between an upper crimped-in portion of the container and the closure.

5. In a dry cell, a metallic container serving as an electrode, a closure serving as the other electrode, electrolyte and depolarizer therein, and insulating means within the container and spacing the depolarizer and closure therefrom, said container having a circular boss on the bottom thereof and being folded over at the top over the closure and insulating means, said insulating means extending beyond the folded over portion of the container.

In testimony whereof, I affix my signature.

RAYMOND C. BENNER.

In testimony whereof, I affix my signature.

HOMER W. JONES.

206 April 5, 1927. H. DE OLANETA 1,623,719

DRY CELL

Filed Aug. 18, 1926

Fig. 1.

Fig. 4.

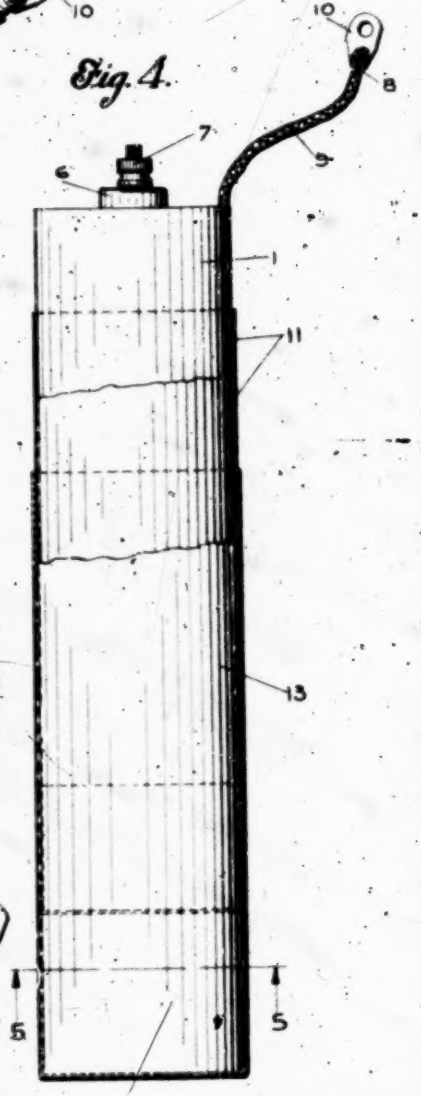



Fig. 5.

Fig. 2.

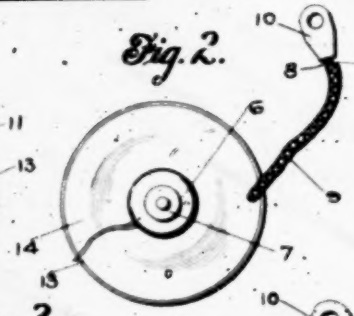
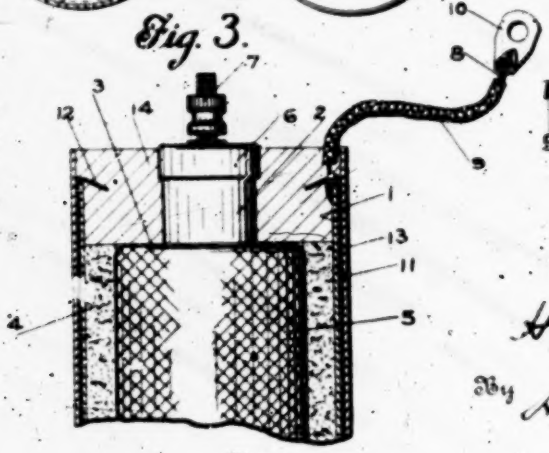



Fig. 3.




Inventor.

Harold de Olaneta

By Henry E. Rockwell

Attorney

Patented Apr. 5, 1927. 1,623,719

# UNITED STATES PATENT OFFICE. 207

HAROLD DE OLANETA, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO WINCHESTER REPEATING ARMS COMPANY, OF NEW HAVEN, CONNECTICUT.

## DRY CELL.

Application filed August 18, 1920. Serial No. 404,381.

This invention relates to galvanic cells and more particularly to that type of the same known as dry cells.

In dry cells of the type now found on the market, it is usual for the zinc cup which forms one pole, or electrode of the cell, to contain the exciting paste, and the depolarizing cartridge which has embedded therein the carbon pencil which forms the second pole of the cell. This carbon pencil is usually provided at the top with a metallic contact member. It is apparent that if such a cell is used in a damp place or in a position where it is exposed to rain or to water which may be splashed thereon, as for instance when used in a motor boat or the like, a film of water is apt to gather on the top of the cell surrounding the metallic contact member and extending out to the zinc cup which forms the other pole of the cell. The cell will in this manner be short-circuited, which, it will be plain, will rob the cell of its power and shorten its life. This invention relates to the provision of a cell in which these defects will have been overcome.

One object of this invention is to provide a water-proof cell.

A second object of this invention is to provide a cell which is not subject to short-circuiting in the manner described.

A further object of the invention is to provide a cell of the type described with a container which will be insulated from the zinc cup of the cell.

With these and other objects in view, the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is an elevational view of a dry cell which embodies my invention.

Fig. 2 is a top plan view of the same.

Fig. 3 is an enlarged sectional view of the upper portion of the cell.

Fig. 4 is a view showing the cell proper, the case of insulating material and the container in extended positions.

Fig. 5 is a sectional view on line 5—5 of Fig. 4 looking in the direction of the arrows.

The dry cell to which my invention is applied may be made in any of the usual methods and constructed in any of the usual forms. In the drawings, I have shown a usual form of such cell consisting of the zinc cup 1, which contains the carbon pencil 2, which in turn is embedded in a depolarizing cartridge 3, contained in the cup and surrounded by the paste 4. The cartridge 3 is usually contained in a bag of cheese cloth or the like 5, which lies between the cartridge and the paste 4. The paste 4, as shown, surrounds the cartridge 3 and lies between it and the zinc cup 1. The carbon pencil 2 is provided at its upper end with a metallic cap 6, upon which is soldered or secured in any desired manner a contact member 7. It is usual to provide a cell of this kind with a seal, at the top, of wax or pitch material, or a seal in the form of a preformed plug of some insulating material, which will prevent the loss of the contents of the cup and will also serve to insulate the metallic cap from the cup. The preferred embodiment of the invention shown in the drawings, however, is not provided with such a seal, which is separate from the seal of the outside container, which is to be hereinafter described. This, however, is not an essential feature of the invention, and if desired, the usual seal of the zinc cup may be provided.

To the zinc cup 1 is soldered or secured in any desired manner a contact wire 8, which is insulated by a covering 9, and provided at its outer end with a contact member 10. The cell with this contact wire applied is then slipped into a casing or covering of paraffined paper or other insulating material 11, which is in the shape of a cylindrical can and is provided with a bottom of the same material, so that the zinc cup of the cell will be completely covered by the paper and will be completely insulated by it from any object with which it might come in contact. In the form shown, the bottom of this paper casing is formed by folding over the lower edge of the cylindrical casing, as shown in Fig. 5. This bottom may, of course, be provided in any other desired manner. As shown in Fig. 3, the top edge 12 of the paper casing is extended and bent over the top of the zinc cup just enough so that the top edge of the cup will be covered by the paper.

The cell with its paper covering is then slipped into an outer container 13, which is in the form of a cylindrical can of any suitable metallic material, which it is seen will be entirely insulated from the zinc cup by

the paper covering. It is not, of course, essential that the outside container 13 be made of metal, as it may be made of any desired material which can be formed into the desired shape and which is economical to manufacture. It is moreover not essential that the casing 11 be made of paper for it may be made of any proper material which will insulate the zinc cup from the container 13. A seal of wax or of a pitch substance 14 or the like is now poured into the top of the outer container, and as shown in Fig. 3, will act as a seal for the cell and will extend up to the top of the container 13.

As shown in Fig. 3, the zinc cup, the case of insulating material and the container are all formed to fit each other snugly, so that there will be no looseness or play between the same and so that the pitch seal will not flow down between them. As shown in this figure, the seal will flow down upon the turned edge 12 of the case of insulating material and will hold it in the position shown. It will be apparent that as shown in Fig. 2, the contact members 7 and 10 will be the only exposed poles of the cell, the zinc cup having been entirely insulated from the atmosphere and from the surrounding container.

It will be apparent that a cell enclosed in a container in this manner will not be subject to short-circuiting by the two poles being connected by a film or body of water as previously described, and for this reason such a cell is particularly adapted for use in an automobile where it might be exposed to rain, or in a motor boat where there is danger of water splashing on or covering the same. Moreover, it is also desirable for use in a damp place where a film of water is likely to form on the top of the cell and connect the zinc cup with the carbon pencil or the contact member thereon.

The zinc cup may, as stated, be covered with any suitable material to insulate it from the outer container, and such a result might be achieved in various ways, such as coating the cup with a paint of asphaltum or similar material. The contact wire 8 may be soldered or secured to make an electrical connection with the zinc cup 1 in any desired way.

In some modifications of this invention it will be necessary to use but one container to surround the zinc cup of the cell. This will be the case when the zinc cup will be covered with a coat of asphaltum paint or like material, or when the outside container is itself made of an insulating material, and the cell, including the zinc cup, may be slipped therein and sealed as shown and described above. In the latter construction, the outer container may be made of hard rubber or of other insulating material, and it will be apparent that a water-proof cell would be formed, which would be very similar to the one described, wherein the outer container is made of conducting material and is separated from the zinc cup by an insulating material.

While I have shown and described a preferred embodiment of my invention, it will be understood that I do not intend to be limited to the exact details shown, as various changes and modifications might be made in the parts shown which will lie within the spirit of the invention and within the scope of the appended claims.

What I claim is:

1. In combination, a dry cell including a containing cup of conducting material, and an outer container in which the cell is enclosed, said containers being completely insulated from each other by a cylindrical wrapper of non-conducting material, the lower end of said wrapper being folded over the bottom of the cup to completely cover the same, and the upper end thereof being folded inwardly over the upper edge of the cup, and means to seal the cup and the container and hold the insulating wrapper in place.

2. In combination, a dry cell including a containing cup of conducting material, an outer container, and an intermediate casing between said cup and outer container, said intermediate casing being formed of insulating material and having its upper and lower ends folded over the upper and lower edges of the dry cell cup, and a seal for the cup and container, the upper folded edge of the casing being embedded in said seal.

3. In combination, a dry cell including a containing cup of conducting material, a cylindrical casing of insulating material embracing said cup and having its lower end folded over the bottom of the cup to completely cover the same, and its upper edge turned inwardly over the upper edge of the cup, an outer cup-shaped container in which the cell is placed, the wall of said container extending upwardly above the wall of the cup, and a seal for the cell placed directly upon the contents thereof and filling the upper portion of the cup and also filling the container above said cup, the upper folded edge of the insulating casing being imbedded in said seal so as to be held in place.

4. In combination, a dry cell including a containing cup of conducting material, a cylindrical casing of insulating material embracing said cup and having its lower end folded over the bottom of the cup to completely cover the same, and its upper edge turned inwardly over the upper edge of the cup, an outer cup-shaped container in which the cell is placed, the wall of said container extending upwardly above the wall of the cup, and a seal for the cell placed directly

upon the contents thereof and filling the upper portion of the cup and also filling the container above said cup, the upper folded edge of the insulating casing being imbedded in said seal so as to be held in place, and an insulated conductor secured to the cup leading outwardly through said seal and imbedded therein.

5. A dry cell comprising a pair of open mouthed, cup shaped containers of conducting material one disposed within the other, a cup shaped casing of insulating material, between said containers, the inner container containing dry cell elements, including an exciting paste, depolarizing material and electrode pencil, said insulating casing having its wall, at the upper portion thereof, turned over the upper edge of the inner container, and a sealing substance filling said inner container above the level of the paste, also filling the unoccupied space in the outer container and holding the folded edge of the insulating casing in position.

In witness whereof, I have hereunto set my hand on this 31 day of July, 1920.

HAROLD DE OLANETA.

212

Jan. 3, 1928. 1,654,823

W. R. MILLAR

FLASH LIGHT BATTERY

Filed Jan. 21, 1927

FIG 1.

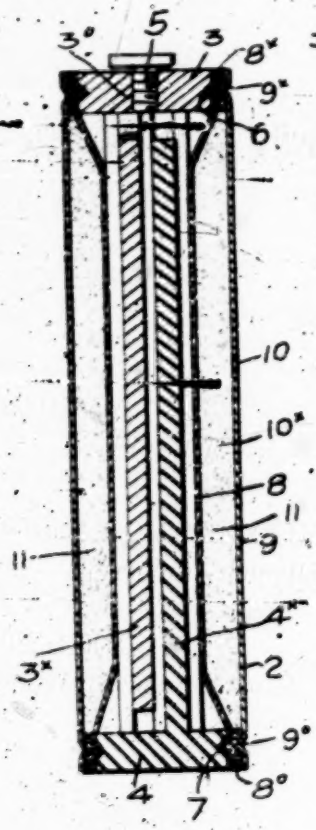



FIG 2

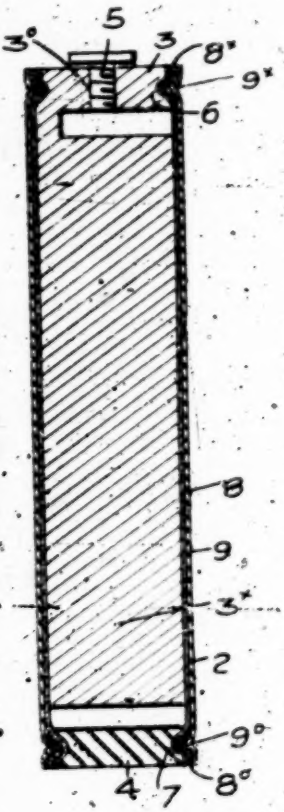



FIG 3.

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W.R.Miller
by J. Thurston Haugh & Co.
Attys.

Patented Jan. 3, 1928. 1,654,823

# UNITED STATES PATENT OFFICE.

WILLIAM ROBERT MILLAR, OF PALMERSTON, ONTARIO, CANADA.

## FLASH-LIGHT BATTERY.

Application filed January 21, 1927. Serial No. 162,584.

My invention relates to improvements in flash light batteries, and the object of the invention is to devise a battery of this type having a long life through not being subjected to polarization, in which gases are accommodated and the voltage maintained approximately constant and therefore a steadier light provided, in which the battery is so constructed that it can be readily sealed, in which the outer battery casing is protected from corrosion so that there is no danger of bursting when left in an exhaustive condition rendering it almost impossible to be removed from the flash light, in which the battery is so constructed that the metallic casing has no electrical contact with the battery elements, in which there is no danger of leakage at any time, and it consists essentially of the arrangement and construction of parts as hereinafter more particularly explained.

Fig. 1 is a sectional view through a flash light showing my battery in position.

Fig. 2 is an enlarged sectional view through a battery constructed in accordance with my invention.

Fig. 3 is a sectional view taken at right angles to that shown in Figure 2.

In the drawing like characters of reference indicate corresponding parts in each figure.

1 indicates a flash light of ordinary construction. 2 indicates my battery which is inserted in the flash light in the usual way. The battery 2 comprises upper and lower heads 3 and 4 from which negative and positive plates $3^x$ and $4^x$ respectively extend, such plates being formed integral with the heads. The upper head 3 is provided with a vent orifice $3^o$ provided with a screw plug 5. The heads 3 and 4 are provided in their periphery with annular grooves 6 and 7.

8 is a flexible sheet rubber casing fitting at its end over the heads 3 and 4 so as to enter the grooves 6 and 7. The rubber casing 8 is normally in a contracted position as clearly indicated in Figure 2 adjacent to each side of the plates $3^x$ and $4^x$. The rubber casing 8 is secured to the heads 6 and 7 by means of a winding $8^x$ and $8^o$ of rubber treated silk thread which is wrapped around that portion of the casing 8 extending around the heads 3 and 4.

9 is an outer metallic casing fitting around the heads 3 and 4 and the surrounding casing casing 8 and at its ends around the windings $8^x$ and $8^o$, the metal being forced into the annular grooves 6 and 7 as indicated at $9^x$ and $9^o$ thereby providing a sealed joint, and at the same time insulating the outer casing from the plates $3^x$ and $4^x$. The casing 9 is provided with a small orifice 10 so that atmospheric pressure is maintained within the space 11 intervening between the casing 9 and casing 8. This space is partially filled with absorbent material such as absorbent cotton, $10^x$, about ten percent of such space being thereby occupied and which serves to absorb any of the active fluid which may leak through the rubber casing 8 if it should at any time deteriorate.

12 is a metallic cap preferably formed of sheet aluminum and filled with absorbent material such as blotting paper so that any of the electrolyte which may creep or spray during charging on the surface of the head 3 from corroding the spring contact or other parts which it might effect.

From this description it will be seen that I have devised a very simple construction of battery which is in the form of a storage battery and therefore will not depreciate through polarization, which occupies the same space occupied by an ordinary flash light battery, which will not become corroded by the leaking of the electrolyte, in which the voltage will be maintained practically constant, and in which there is no electrical contact between the elements of the battery and the exterior metallic casing.

What I claim as my invention is:

1. A flash light battery comprising an upper and lower head, positive and negative plates each formed integral with the corresponding head and extending from opposite ends of the battery, a casing formed of flexible liquid proof material surrounding the heads at each end adapted to expand by gas pressure created within the battery during discharge.

2. A flash light battery comprising an upper and lower head, positive and negative plates each formed integral with the corresponding head and extending from opposite ends of the battery, a casing formed of flexible sheet rubber extending around the heads at each end and between the heads to surround the plates.

3. A flash light battery comprising an upper and lower head, positive and negative plates each formed integral with the corresponding head and extending from opposite

ends of the battery, and an outer metallic casing surrounding and extending between the heads, means for insulating the outer casing from the heads, and means for protecting the outer casing from the corrosive action of the electrolyte within the battery.

4. A flash light battery comprising an upper and lower head, positive and negative plates each formed integral with the corresponding head and extending from opposite ends of the battery, an exterior metallic casing surrounding the heads, and an inner flexible casing of insulating material interposed at its ends between the heads and the outer casing.

5. A flash light battery comprising an upper and lower head, positive and negative plates each formed integral with the corresponding head and extending from opposite ends of the battery, and an exterior metallic casing surrounding the heads, an inner flexible casing of insulating material interposed at its ends between the heads and the outer casing, a filling of absorbent material located in the intervening space between the metallic casing and the inner casing.

6. A flash light battery comprising upper and lower heads each provided with an annular peripheral groove, battery plates carried by the heads and extending in opposite directions longitudinally of the battery, a rubber casing fitting at its ends around the heads so as to enter the grooves, an outer metallic casing having that portion thereof, surrounding the heads and the rubber casing, pressed into the grooves of the heads.

7. A flash light battery comprising upper and lower heads each provided with an annular peripheral groove, battery plates carried by the heads and extending in opposite directions longitudinally of the battery, a rubber casing fitting at its ends around the heads so as to enter the grooves, an outer metallic casing having that portion thereof, surrounding the heads and the rubber casing, pressed into the grooves of the heads, and a packing of rubberized silk thread interposed between the ends of the rubber casing and the metallic casing surrounding the heads.

8. In a flash light battery, the combination with the heads thereof, one of which is provided with an orifice, and the plates and casing carried by the heads, of a closure plug for the aforesaid orifice, a metallic cap extending over the plug and provided with downwardly projecting portions bearing upon the head of the casing.

WILLIAM ROBERT MILLAR.

Feb. 12, 1935. H. R. C. ANTHONY 1,991,132

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DRY CELL

Filed June 11, 1932

Fig 1

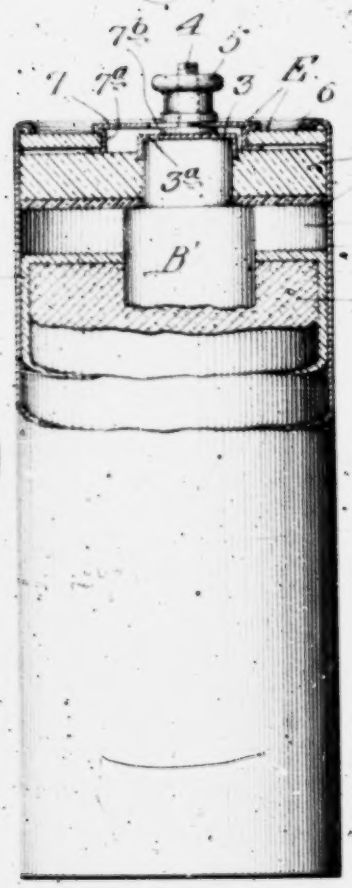


Fig 2.

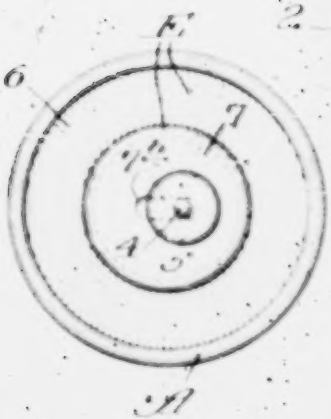


Fig 3.

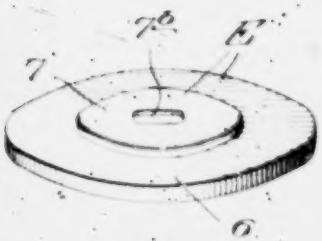


Fig 4.

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Herman R. C. Anthony
By Lyon, Lyon & Co. Attorneys
Atty's

Patented Feb. 12, 1935

1,991,132

217

# UNITED STATES PATENT OFFICE

1,991,132

## DRY CELL

Herman R. C. Anthony, Madison, Wis., assignor to French Battery Company, Madison, Wis., a corporation of Wisconsin

Application June 11, 1932, Serial No. 616,709

6 Claims. (Cl. 136—133)

This invention relates to dry-cells, and is applicable both to flashlight cells and standard cells equipped with terminals adapted for connection with electric conductors.

The primary object is to provide a hermetically sealed cell of improved construction, which is strong, durable and of pleasing appearance.

The invention is illustrated in preferred embodiments in the accompanying drawing, in which:

Fig. 1 is an elevational view, partly in section, of a standard dry-cell embodying the invention;

Fig. 2 is a plan view of the cell shown in Fig. 1;

Fig. 3 is a perspective view of a pre-formed outer closure employed; and

Fig. 4 is an elevational view, partly in section, of a flashlight cell embodying the invention.

In the construction illustrated in Figs. 1–3, A designates a container, preferably of zinc, which constitutes one electrode of the cell; B a body of depolarizing mixture within the container, within which is embedded a carbon pole B' which extends some distance beyond the upper end of the depolarizing body; C a washer embracing the upper portion of the carbon pole, and preferably separated from the body B by a space 1, said washer being preferably impregnated with paraffin; D a layer of sealing compound above the washer C and forming a hermetic seal between the carbon pole and the wall of the container; and E a pre-formed closure disposed above and serving to protect the sealing compound.

The container A may be constructed in any suitable manner. Preferably it consists of a zinc cup drawn from a disk of said zinc.

The depolarizing body B may consist of any suitable material for the purpose known to the art. This body is shown enveloped within a bibulous lining 2, which may be of paper or cloth, and which may be impregnated with a suitable electrolyte.

The disk C usually is formed from cardboard, and preferably is impregnated, as stated.

The sealing compound may be poured, in molten condition, into the cell and allowed to harden therein. This compound may be any suitable compound adapted to produce a hermetic seal, and preferably is somewhat tacky, so that it will form and maintain air-tight joints with the inner wall of the container and with the upper portion of the carbon electrode. The carbon is shown provided with a shoulder on which the washer C is supported, but this is not essential.

The reduced upper end of the carbon is shown fitted with a metal cap 3, which is equipped with a threaded stud, or terminal-stem 4. The sealing compound is shown covering a portion of the flange of the cap 3, but this is not essential. The threaded stud 4 is equipped with a nut 5.

The pre-formed outer closure E is shown as comprising a straight annulus 6 of insulating material, and a metal terminal-disk 7, which forms a center for said outer closure. Preferably the disk 6 is constructed of strong, fibrous material, such as hard fiber, or strong pasteboard; and preferably the central terminal disk 7 is provided with a peripheral channel, indicated at $7^a$, which receives the inner peripheral portion of the annular disk 6. The channel $7^a$ may be provided by bending the peripheral portion of the metal disk downwardly and then striking inwardly the bent portion to form the peripheral channel. The walls of the channel may be clinched upon the inner peripheral portion of the member 6. The outer peripheral portion of the disk 6 fits snugly within the upper portion of the container A; and the outer closure is secured in position over the sealing compound D in any suitable manner, but preferably by spinning or curling the upper edge of the container inwardly to form a bead with the edge portion pressing firmly against the upper surface of the member 6.

The terminal disk 7 is provided with a perforation $7^b$, which preferably is in the form of a slot adapted to permit the terminal-stem 4 to extend therethrough, regardless of whether or not said terminal-stem is off-center. In the manufacture of cells of this character, the carbon poles are not always truly centered. In the present construction, the terminal-disk 7 is centrally located by preference, and the appearance of the cell will not be marred by reason of eccentric location of the terminal-stem, within reasonable limits. Hence, the improvement renders it wholly unnecessary to discard cells which do not have the carbon pole accurately centered. In Figs. 1 and 2, the eccentricity commonly incidental to manufacture is shown exaggeratedly, for purposes of illustration.

In the flashlight cell embodiment shown in Fig. 4, A' designates the container; $B^2$ the core or depolarizing body equipped with a carbon pole $B^3$; C' the pasteboard disk separated by a space $1^a$ from the upper end of said core; D' a layer of sealing wax or the like forming a hermetic seal; and E' a pre-formed outer closure.

In this instance, the outer closure is shown as comprising a straight pasteboard disk $6^a$, and a terminal-disk $7^c$. Here, the terminal disk $7^c$ is in

the form of a cap, which embraces the upper end portion of the carbon pole; and the straight portion of this cap is formed to provide a peripheral channel which receives the inner peripheral portion of the disk 6ª. The upper portion of the member 7ᵉ is in the form of a hollow boss adapted to serve as a contact-member. The dome-portion of the member 7ᶜ is shown provided with a vent 7ᵈ.

Reverting to the construction shown in Fig. 1, the carbon cap 3 is shown provided with a vent 3ª; also, the capped end of the carbon is largely housed within the terminal-disk 7, whose lower side presents a cavity, as shown in each construction described. The air space above the depolarizing body serves to receive any excess gases which may be generated within the cell and permit the gases to escape eventually through the carbon pole and through the vents associated with the central terminal of the cell. The provision of specially formed vents is not always an essential. For example, in Fig. 1, it is obvious that if the sealing compound D did not envelop the lower edge portion of the flange of the cap 3, the gases could escape from the carbon pole into the space within the outer terminal in cap 7, and thence through the slot 7ᵇ to the atmosphere.

It may be said further, with reference to the pre-formed outer closure employed, that it is a disk-like structure formed from hard, fabricated material, adapted to withstand shock and to serve as a protection to the upper end of the carbon pole and the sealing compound employed in the cell. It is necessary, of course, that the carbon pole be insulated from the upper portion of the container; and preferably this is accomplished by employing the annular disk 6 of insulating material in conjunction with a metal center cap, such as 7, which is associated with the central terminal of the cell.

The improved cell is adapted to prevent escape of electrolyte from the cell and consequent corrosion of the central terminal. The inner hermetic cell is protected by the outer pre-formed closure, which, in turn, is held firmly against the upper end of the carbon pole. The cell is of sightly appearance, strong and durable, and there is little danger of the parts becoming loose or broken, even under severe usage of the cell.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

What I regard as new and desire to secure by Letters Patent is:

1. A dry-cell comprising: a container forming one electrode of the cell; a depolarizing body therein equipped with an upwardly projecting carbon pole; a cap on said pole equipped with a terminal; a layer of sealing compound spaced above said body and hermetically sealing the space between said carbon pole and container; and a pre-formed closure comprising an annulus of hard, fibrous material secured in the upper portion of said container, and a metal terminal-disk having its peripheral portion permanently secured to said annulus and having a perforation through which said terminal extends.

2. A dry-cell as specified in claim 1, in which the perforation in said terminal-disk is elongated to permit said terminal to protrude therethrough when the terminal is off-center.

3. A dry-cell comprising: a metal container having an inwardly-spun upper margin; a depolarizing body in said container having an upwardly extending central electrode; a layer of sealing compound spaced above said body and interposed between said central electrode and said container and forming a hermetic seal; and a pre-formed outer closure comprising a central metal terminal-disk having an outwardly extending annular flange and an encircling annular fibrous disk carried by said flange, said terminal-disk being cupped to accommodate the upper portion of said electrode and the outer marginal portion of said fibrous disk being engaged by the inturned portion of said container.

4. A dry-cell as specified in claim 3, in which said electrode is fitted with a cap equipped with a threaded terminal-stem, which extends through an elongated opening provided in said central metal terminal-disk.

5. A dry-cell comprising: a container forming one electrode of the cell; a depolarizing body therein equipped with an upwardly projecting carbon pole; a layer of sealing compound forming a hermetic seal with the upper portion of said carbon pole and the inner surface of said container; and a pre-formed outer closure disposed above said sealing compound and secured within the upper portion of said container, said outer closure comprising an annulus of insulating material having its outer peripheral portion engaging the inner wall of said container, and a metallic center disk having a pair of laterally extending annular flanges clinched to the inner marginal portion of said annulus and adapted to engage said carbon pole.

6. A dry-cell comprising: a metal container having an inwardly-spun upper margin; a depolarizing body in said container having an upwardly extending central electrode; a cap having a threaded terminal stem mounted on said electrode; a layer of sealing compound spaced above said body and interposed between said central electrode and said container and forming a hermetic seal therewith; and a pre-formed outer closure comprising a central terminal-disk having an elongated perforation impaled by said terminal stem, and an encircling annular fibrous disk carried thereby, said terminal-disk being cupped to accommodate the upper portion of said electrode and the outer portion of said fibrous disk being engaged by the in-turned portion of said container.

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May 7, 1935. P. CORIGLIANO 2,000,510

DRY CELL

Filed March 2, 1932 2 Sheets-Sheet 1

Fig. 1.

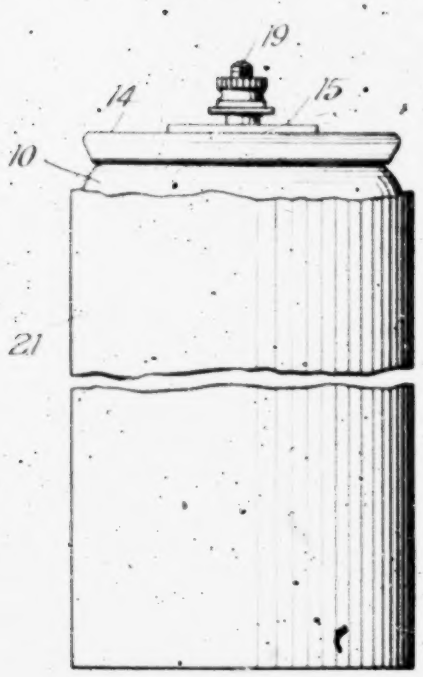



Fig. 2.

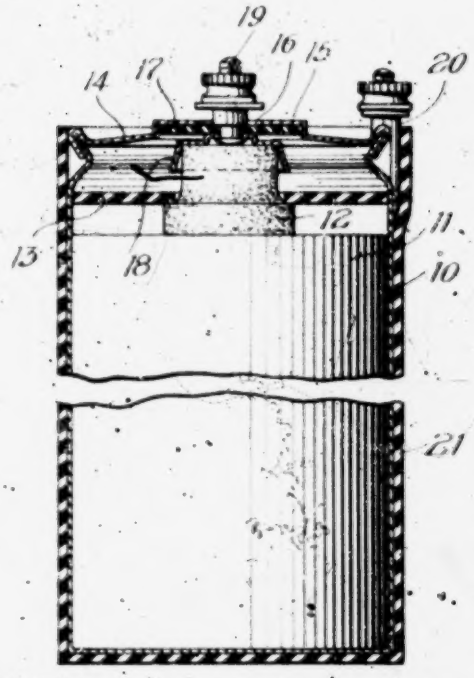



Fig. 3.

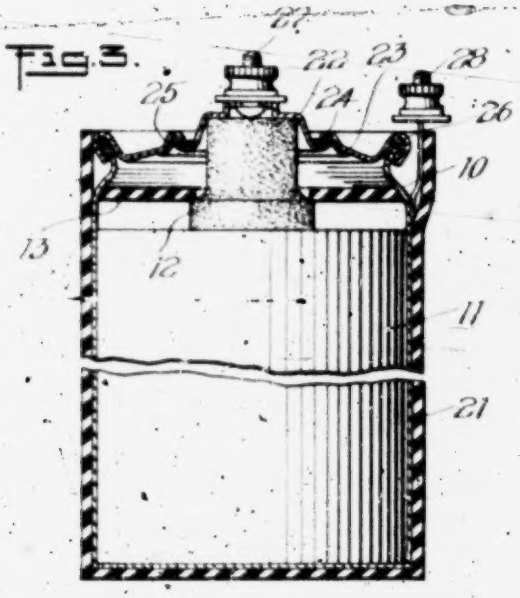
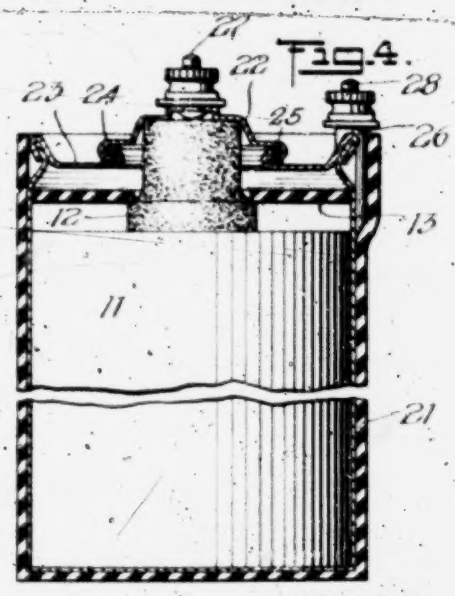



Fig. 4.

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DRY CELL

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Fig. 5.

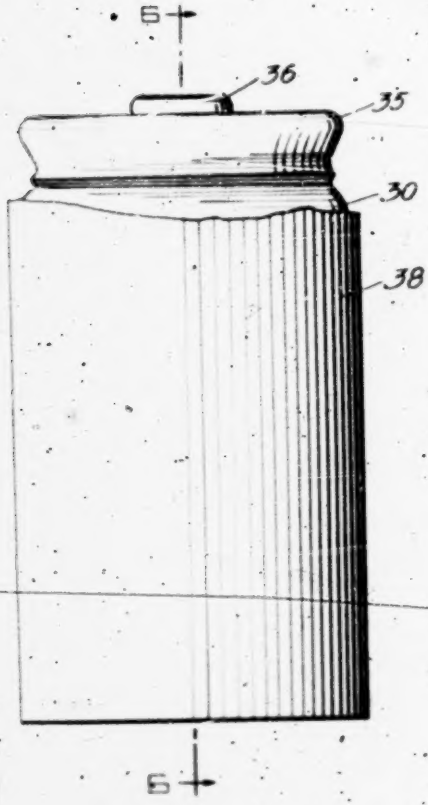
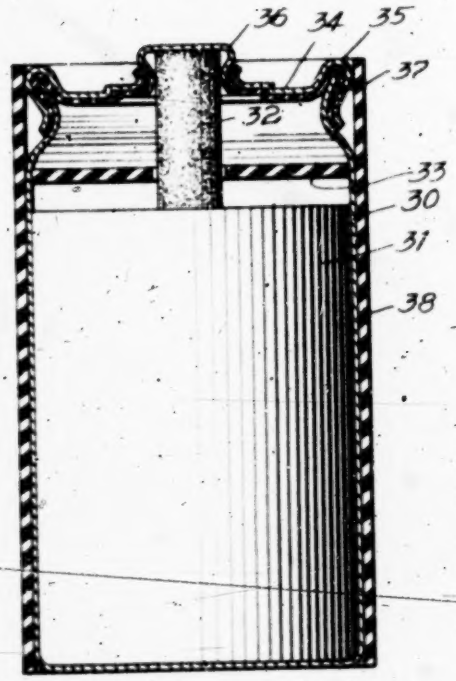



Fig. 6.

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Patented May 7, 1935

2,000,510

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# UNITED STATES PATENT OFFICE

2,000,510

## DRY CELL

Peter Corigliano, St. Albans, N. Y., assignor to Bright Star Battery Company, Hoboken, N. J., a corporation of New York

Application March 2, 1932, Serial No. 596,223

5 Claims. (Cl. 136—133)

This invention relates to dry cells and has for an object an inexpensive and an efficient dry cell having an improved seal for eliminating the use of sealing compounds previously used.

A dry cell embodying this invention comprises the usual metal cup within which is contained a cartridge having the usual central electrode. The closure for the cup comprises a two-part rigid cover attached at its periphery to the metal cup. The outer portion of the cover is of metal and the inner portion may be either of metal or insulating material. The inner portion if, of metal, either may constitute one terminal of the battery or may have a binding post supported thereby. The inner portion, if of insulating material, supports a binding post. In any event, the central portion of the cover or binding post carried thereby is in electrical contact with the central electrode. In an all metal cover, the inner portion is insulated from the outer portion or the outer portion is insulated from the cup so that short-circuiting is prevented. This closure arrangement eliminates the use of the sealing compounds previously used and which are subject to many defects. It permits the use of a larger cartridge in the same size container, thereby resulting in an increased battery life. It also provides a tight seal regardless of temperature conditions and renders the battery less expensive to manufacture than batteries using sealing compound.

Other objects, novel features and advantages of this invention will be apparent from the following specification and accompanying drawings, wherein:

Fig. 1 is an elevation of a dry cell embodying the invention;

Fig. 2 is a vertical section of such cell;

Figs. 3 and 4 are vertical sections through modified forms of cells;

Fig. 5 is an elevation of a modified form of cell, and

Fig. 6 is a section on the line 6—6 of Fig. 5;

Referring now more especially to Figs. 1 and 2, the battery consists of a metal cup 10 in which is contained a cartridge 11, centrally of which is provided a carbon electrode 12. A paper washer 13 is arranged within the cup and has an aperture through which the carbon electrode extends, this washer serving to center the carbon electrode during assembly and also to form a gas chamber. A metal cover 14 is permanently attached at its periphery to the rim of the cup by crimping the edge of the cover over the rim of the cup. The cover is formed with a central offset 15 in which is provided a central aperture 16. A fibre disk 17 or a preformed disk of other suitable insulating material is mounted in the offset 15, the metal of the cover preferably being rolled under the disk to lock it permanently in the offset. A metal cap 18 is riveted to the fibre disk 17 by a stud 19 which extends through the aperture 16 and constitutes one of the binding posts of the battery. The cap 18 fits over the upper end of the carbon electrode and makes electrical contact therewith.

A second binding post 20 is attached to the cup 10 in the usual manner. A paper jacket 21 of the usual type surrounds the cup 10. The two binding posts are insulated from each other by reason of the insulating qualities of the fibre disk 17.

In the modification disclosed in Fig. 3, the cover is formed of two sections 22 and 23 which are crimped together permanently at 24 with an annulus of insulating material 25 maintaining them out of electrical contact. The metal cover rests on the central electrode 12 and is permanently joined at its periphery to the rim of the cup 10, the cover and cup being maintained out of electrical contact by interposed insulating material 26. A binding post 27 is riveted to the central portion of the cover and a second binding post 28 is attached to the cup 10. In this type of cell, the section 23 of the cover is of neutral polarity as it is insulated from both poles of the cell.

In the modification disclosed in Fig. 4, the cover is composed of two sections 22 and 23 which are crimped together at 24 with an annulus of insulating material 25 interposed to maintain the two sections out of electrical contact. The cover is permanently attached at its outer periphery to the cup in electrical contact therewith. Binding posts 27 and 28 are provided, the binding post 27 being connected to the section 22 of the cover, while the binding post 28 is connected to the cup 10.

Referring now to Figs. 5 and 6, a metal cup 30 contains a cartridge 31 provided with a centrally arranged carbon electrode 32, the upper end of which projects slightly above the rim of the cup and has a paper washer 33 associated therewith. The cup is closed by a two-part metal cover 34 having near its periphery an annular pocket 35 in which is received the upper end of the cup 30. The cover 34 is formed in two parts, the central part 36 of which constitutes a cap to receive the upper end of the carbon electrode 32. The central portion 36 is provided with a groove in which is rolled the curved inner edge of the remaining

portion of the cover. A disk 37 of insulating material has its inner edge arranged between the two parts of the cover and is tightly clamped therebetween. The disk underlies the cover 34 and is fitted into the pocket 35, thus being interposed between the cup 30 and the cover 34. The central portion of the cover is insulated from the remaining portion which in turn is insulated from the cup 30. The major portion of the cover is thus neutral and serves to prevent accidental short-circuiting of the cell. The usual paper shell 38 surrounds the cup 30.

The cells above described are provided with tight seals which will withstand varying temperature conditions and also rough usage, thereby preventing drying out of the cell. In each instance, sealing wax is completely dispensed with and the cell is provided with a strong metal closure.

It is of course understood that various modifications may be made in the structure above described, without in any way departing from the spirit of the invention as defined in the appended claims.

I claim:

1. A dry cell comprising a metal cup containing a cartridge having a centrally arranged electrode, a metal cover comprising a central continuous metal portion recessed to receive and enclose the upper end of said electrode, and an outer continuous metal portion having rigid, permanent connection at its outer edge with the rim of said cup, the outer edge of the central portion and the inner edge of the outer portion being crimped together and forming a permanent mechanical connection between said portions, and insulation interposed between said central and outer portions.

2. A dry cell comprising a metal cup containing a cartridge having a centrally arranged electrode, a metal cover comprising a central continuous metal portion recessed to receive and enclose the upper end of said electrode and an outer continuous metal portion having rigid, permanent connection at its outer edge with the rim of said cup, the outer edge of the central portion and the inner edge of the outer portion being crimped together and forming a permanent mechanical connection between said portions, and insulation interposed between said central and outer portions and between said outer portion and said cup.

3. A dry cell comprising a metal cup containing a cartridge having a centrally arranged electrode, a cover closing said cup with the central electrode completely enclosed, said cover constituting the sole sealing means for said cover and being composed of a central metal portion and an outer metal portion having a permanent rigid connection at its outer edge with the rim of the cup, the outer edge of the central portion and the inner edge of the outer portion being crimped together and forming a permanent mechanical connection between said portions, said central portion being electrically insulated from said cup and being electrically connected with said electrode.

4. A dry cell comprising a metal cup containing a cartridge having a centrally arranged electrode, a cover closing said cup with the electrode completely enclosed, said cover being composed of a central metal portion and a metal outer portion, the outer edge of the central portion and the inner edge of the outer portion being crimped together and said outer portion having rigid connection at its outer edge with the rim of said cup, and insulation between said central and outer portions, said central portion being electrically connected with said electrode.

5. A dry cell comprising a metal cup containing a cartridge having a centrally arranged electrode, a cover closing said cup with the electrode completely enclosed, said cover being composed of a central metal portion and a metal outer portion, the outer edge of the central portion and the inner edge of the outer portion being crimped together and said outer portion having rigid connection at its outer edge with the rim of said cup, and insulation interposed between said central and outer portions and between said outer portion and cup, said central portion being electrically connected with said electrode.

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Nov. 17, 1936. R. R. SMITH 2,060,832

DRY CELL

Filed May 27, 1930

Fig 1

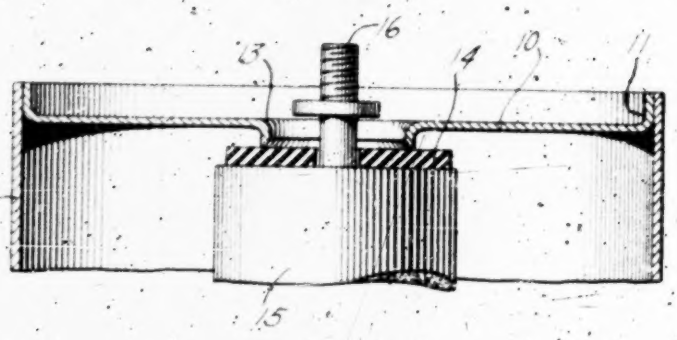



Fig 2

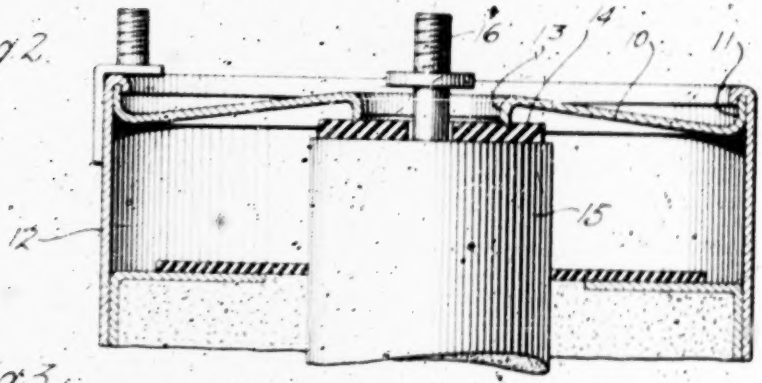



Fig 3

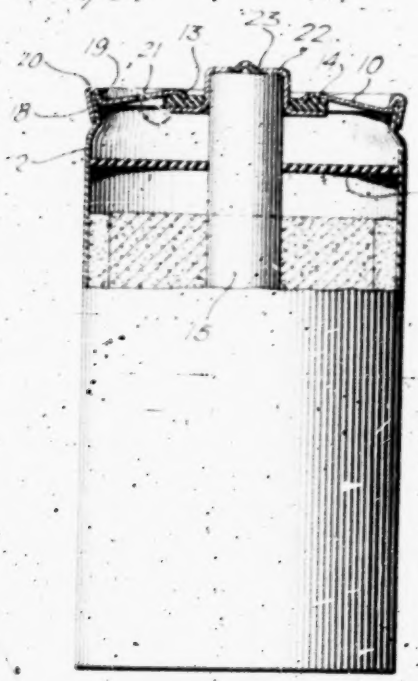
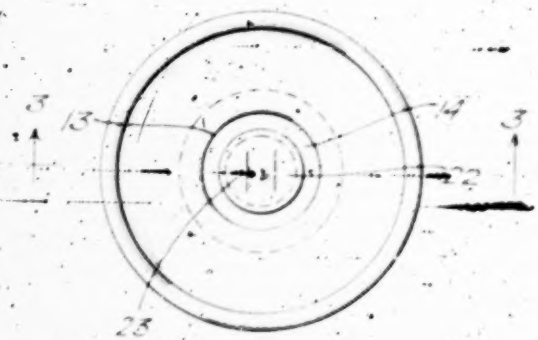



Fig 4

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Byrnes, Townsend & Brett ATTORNEYS.

Patented Nov. 17, 1936

2,060,832

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# UNITED STATES PATENT OFFICE

2,060,832

## DRY CELL

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Application May 27, 1930, Serial No. 456,172

34 Claims. (Cl. 136—133)

This invention relates to dry cells and particularly to improved means for closing and sealing such cells. The present application is a continuation in part of my application Serial No. 432,217 filed on February 28, 1930.

In the manufacture of dry cells it has been common practice to close the cell by placing a layer of sand over the top of the mix body and then pouring a layer of sealing compound, such as coal tar pitch or a rosin-base sealing wax, over the sand. This type of closure is not altogether satisfactory due to the manufacturing difficulties experienced in handling the compound and in applying it to the cells. The completed closure is also quite brittle when cold and, consequently, is easily broken during handling and shipment; it becomes quite plastic when subjected to relatively high summer temperatures; and bulges or is forced from its proper location by internal gas pressure.

Another objection to this type of closure is that it must be made comparatively thick in order to obtain the required strength, and this reduces cell space and electrode area which otherwise might be employed to increase the capacity of the cell.

Another objection to this type of closure is that the area of the gas vent is capricious and not subject to manufacturing control. In dry cells having this type of closure the gas generated within the cell is vented through the joint between the sealing compound and the zinc container or electrode. The fact that this joint is not tight and that the cell gas is vented through it is largely accidental and, as a consequence, the vent varies in size according to variations in conditions not readily controlled. As a result, the size of the vent is too large in some cells and too small in others, and in the majority of cases it is effective for only a limited range of service conditions.

Therefore, some of the objects of this invention are to provide an improved closure or seal for dry cells which takes up very little of the valuable space within the cell; is neat in appearance; low in cost; easy to manufacture and apply; uniform and effective to vent gas from the cell; and avoids various objections encountered in the use of wax and other types of closures.

These and other objects and the novel features of this invention will be apparent from the following description and the accompanying drawing, in which:

Figs. 1 and 2 are enlarged vertical sectional views of the top end of a dry cell showing the improved closure in place before and after the cell is sealed, and

Figs. 3 and 4 are, respectively, enlarged sectional and top views of a dry cell having a modified closure embodying this invention.

The improved closure may have a variety of forms according to the size and shape of the cell, its interior structure, and the use for which it is intended. As shown in Figs. 1 and 2 of the drawing, the improved closure comprises an annular sealing member or cover 10 that is relatively hard and resilient in comparison with the annular washer or seat 14, formed for example from a relatively thin resilient metal, such as sheet steel from about .010 to .030 inch thick, having an upturned flange 11 at its outer edge fitting snugly within the upper rim of the zinc container, can or cup 12, which rim is turned down over the flange. The cover preferably has a downturned flange 13 at its inner edge adapted to press tightly against an annular insulating seat 14 that is relatively soft and yielding in comparison with the cover 10, for example, a washer of paper, rubber, fiber, or similar material, mounted on the upper end of the central carbon electrode 15. The downturned flange may have a sharp edge adapted to embed in the washer 14, as shown in Figure 2. A metal dowel 16, embedded in and extending upward from the center of the electrode 15, projects through an opening in the washer 14 and serves as the central circuit terminal of the cell.

The inner and outer surfaces of the cover 10 are preferably coated with a layer of body of enamel, varnish, lacquer, or similar material which adheres to and insulates such surfaces and protects them from corrosion. The joint between the closure 10 and the container 12 may be further sealed with asphalt paint, rubber cement, or similar plastic composition; and the joint between the top of the electrode 15 and the bottom of the insulating washer 14 may be sealed with a similar plastic composition. However, a sealing composition in either of these joints is not essential to the successful operation of the improved cell and closure.

When the cover 10 is secured in place it is pressed into effective sealing contact with the washer 14 in order to insure a fluid-tight joint between the cover, the washer, and the carbon electrode. This pressure is preferably provided by deforming the cover 10 during the final assembling operation. Prior to this operation the downturned flange 13 is resting on the washer 14 and the upper edge of the upturned flange 11 is

substantially flush with the top of the can 12 as shown in Fig. 1. The final assembling operation consists in rolling or crimping the upper edge of the can 12 inward and then down over the upturned flange 11, thus rigidly and permanently securing the outer edge of the cover to the container. In performing this operation the outer edge of the cover is preferably depressed so that the cover is dished and exerts some downward pressure on the washer 14.

It is obvious that the joint formed between the flange 13 and the seat or washer 14 is of such a nature that, while gas-tight at ordinary pressures, it is adapted to open and allow the escape of any gas that accumulates to produce a pressure sufficient to overcome the resilience of the cover 10. While this method of venting alone serves well in some cases, it is usually desirable that it be supplemented by the provision of another vent to operate at relatively lower pressure and of a more fixed nature.

The resulting combination is particularly efficient from the standpoint of cell quality, since any venting system must be a compromise between excessive loss of moisture from the cell and the accumulation of high gas pressures. In the present case the low pressure vent may be placed at a relatively lower capacity value than otherwise, since it must care only for normal operating conditions. This yields minimum loss of moisture from the cell, since the high pressure vent is normally closed and operates only under abnormal conditions such as, for example, may be introduced by excessive temperatures, or whenever abnormal quantities of gas are produced, causing excessive pressures within the cell.

It is practical to control the character of the venting valve provided by the washer 14 and the flange 13, and the pressure necessary to open it, by the regulation of several factors. The primary factor is the nature of the insulating washer, and the second is control of the pressure that the flange 13 exerts upon the washer by varying the distance that the outer edge of the cover is depressed during the sealing and assembling operation, or by varying the thickness or resiliency of the cover material.

While the washer itself may in some cases form a practical low pressure vent by using suitable material, such as oil-treated pulpboard, that is impervious to moisture but pervious to gas under the mechanical pressure sustained, it usually is preferable to use a carbon electrode that is sufficiently porous to vent the gas that normally occurs. A particular advantage of the latter procedure is that it facilitates the escape of gas generated in the lower regions of the cell. In such a case the electrode may be partially impregnated with a water-repellent substance such as lubricating oil or paraffin to yield the desired venting characteristics. It is then preferable to use an impervious seat or washer such as rubber, fiber or more cheaply a washer made from a bibulous material such as pulpboard thoroughly impregnated with a water-repellent mixture composed of 50 per cent rosin and 50 per cent paraffin by weight.

In six inch cells of the construction shown in Figures 1 and 2 suitable electrode impregnation covers a wide range according to the type of mix and paste used. At least one-tenth of the voids normally occurring in the carbon electrode are ordinarily filled with water-repellent impregnating material. More frequently the electrode impregnation is higher and may be such as to fill half the voids or even more. In this case an impregnated pulpboard washer as described above, and about .04 inch thick is suitable. Under these conditions the normal preferred practice to obtain suitable flange pressure upon the washer is to depress the outer edge of the cover about $\frac{3}{32}$ inch during the assembling and sealing operation.

It is obvious that the conditions for this control will vary according to the materials selected the purposes in view, and the type and size of cell, but it has been found that practical control can be readily achieved. This is true over a practical range of tolerances with respect to relative positions of the top of the can and the top of the electrode. The ability of the construction to accommodate itself to variations of this nature represents a point of very important practical value from a manufacturing viewpoint.

On some types of dry cells, such as the sizes for flashlights, it is advantageous to use the modified form of closure shown in Figs. 3 and 4, which embodies the principles of this invention and differs only in a few details from the construction shown in Figs. 1 and 2. In Figs. 3 and 4, the annular sheet metal closure 10 has a downturned flange 18 at its outer edge and is bent downwardly within this flange, as at 19, so that a groove 20 is formed at the outer edge of the closure. The upper end of the zinc container 12 is crimped into the groove 20 and these parts may be slightly inclined outwardly and upwardly, as shown, the closure being thus permanently secured to the container by a substantially gas-tight joint. The washer 14 is carried by the carbon electrode 15, being supported thereon by an outturned annular flange 21 at the lower edge of a metal cap 22 which fits the upper end of the electrode. The cap projects outwardly through the central opening in the washer and serves as the central circuit terminal of the cell. The top of the cap 22 is preferably provided with one or more openings, such as the slits 23, through which gas may escape after passing through the carbon electrode. A disk 24 of paperboard may snugly fit the outside of the electrode and the inside of the can in the space above the active material, sometimes designated as a cartridge, i. e., the mix body and the electrolyte, to prevent expanding electrolyte from contacting with the metal flange 21. In all other features the cell and closure shown in Figs. 3 and 4 may embody the same construction and operation as the one shown in Figs. 1 and 2.

It is also within the scope of this invention to vary the form of the central venting valve by omitting the flange 13, and by providing a flange or ridge on the upper side of the insulating washer 14 to make contact with a flat surface at the inner edge of the closure 10. Also, the outer edge of the closure 10 may be secured to the top of the container by other means such as soldering, and the flange 11 may be turned downward either inside or outside of the container 12. While the closure is preferably constructed of resilient sheet metal as described, other stiff sheet material, such as fiberboard, paperboard, hard rubber, bakelite, or the like may be substituted therefor. Various other changes may be made in the form and arrangement of the component parts, and well-known equivalent materials may be substituted, without departing from this invention or sacrificing its advantages.

I claim:

1. In a dry cell; the combination of means for venting the amount of gas normally generated therein without loss of a substantial amount of moisture; with means for venting abnormal amounts of gas to prevent the pressure thereof from injuring said cell.

2. In a dry cell; the combination of means for equalizing gas pressure in said cell and for venting the amount of gas normally generated therein without loss of a substantial amount of moisture; with means for venting abnormal amounts of gas to prevent the pressure thereof from injuring said cell.

3. In a dry cell wherein gas is generated at a varying rate during the operation of the cell, the combination of means whereby such gas is vented at a rate materially below the maximum rate of gas generation in the cell, to conserve the cell moisture and limit injurious effects for "breathing"; and means whereby additional gas is vented when the rate of generation exceeds the venting rate of the first mentioned means.

4. In a dry cell having a can; a carbon electrode in said can; a washer on said electrode having an opening; and a metal cover sealed to said can and having an opening therein with the edge thereof resting on said washer; the combination of means for venting a normal amount of cell gas through said electrode and the opening in said washer, with means for venting an abnormal amount of cell gas around said electrode through the opening in said cover.

5. A dry cell comprising a zinc container, a carbon electrode therein, a relatively soft and yielding insulating washer carried by said electrode, and a relatively hard and resilient annular closure having its outer edge permanently secured to the upper end of said container and its inner edge contacting with said washer yet free to flex upwardly to vent gas from the cell.

6. A dry cell according to claim 5 in which the carbon electrode is sufficiently porous to vent gas from the cell and has a portion thereof exposed to the outer atmosphere.

7. A dry cell comprising a container, an electrode therein, a washer of a relatively soft and yielding porous material carried by said electrode with a portion thereof exposed to the outer atmosphere, and a relatively hard and resilient annular impervious closure having its outer edge permanently secured to the upper end of said container and its inner edge contacting with said washer yet free to flex upwardly to vent gas from the cell.

8. A dry cell comprising a zinc container, a carbon rod electrode therein, a relatively soft and yielding insulating washer carried by said electrode, and an annular resilient sheet metal closure having its outer edge permanently secured to the upper end of said container and having its inner edge turned downwardly, said closure being so deformed that its inner edge presses tightly against said washer.

9. A dry cell comprising a container; an electrode therein and having a portion thereof exposed to the outer atmosphere, said electrode being sufficiently porous to vent gas from the cell at a rate below the maximum rate of gas generation in the cell while preventing the escape of moisture, a seat on said electrode, and a resilient annular closure for said container, said closure having its outer edge permanently secured to the upper end of said container and its inner edge contacting with said seat yet free to flex upwardly to vent gas from the cell at a rate greater than the electrode.

10. A dry cell comprising a container, a porous electrode therein normally adapted to vent gas from said cell and having a portion thereof exposed to the outer atmosphere, a relatively soft and yielding washer carried by said electrode, and a relatively hard and resilient annular closure for said container, said closure having its outer edge permanently secured to the upper end of said container by a substantially gas-tight joint and having its inner edge pressing against said washer but separable therefrom to release excessive gas pressure in said cell.

11. A dry cell comprising a zinc container; a porous carbon electrode therein having a portion thereof exposed to the outer atmosphere and normally adapted to vent gas from said cell; a relatively soft and yielding insulating disk carried by said electrode; and an annular resilient sheet metal cover having its outer edge permanently secured to the upper end of said container by a gas-tight joint and having its inner edge contacting with said disk but free to separate therefrom to release abnormal gas pressure in said cell.

12. A dry cell comprising a container, an electrode therein carrying a metal circuit terminal, a relatively soft and yielding disk mounted on said electrode and having an opening through which said terminal projects, and a relatively hard and resilient annular cover for said container, said cover having its outer edge permanently secured to the upper end of said container and its inner edge contacting with said disk yet free to flex upwardly to vent gas from the cell.

13. A dry cell comprising a metal container, a carbon electrode therein carrying a metal circuit terminal, an insulating disk mounted on said electrode and having a relatively soft and yielding opening through which said terminal projects, and a relatively hard and resilient annular sheet metal cover for said container, said cover having its outer edge permanently secured to the upper end of said container and its inner edge contacting with said disk yet free to flex upwardly to vent gas from the cell.

14. A dry cell comprising a zinc container, a porous carbon rod electrode adapted to vent gas from said cell, a metal circuit terminal carried by said electrode, an insulating disk mounted on said electrode and having an opening through which said terminal projects, and an annular resilient sheet metal closure for said container, said closure having its outer edge permanently secured to the upper end of said container by a gas-tight joint and its inner edge turned downwardly, said closure being so deformed that said inner edge contacts with said seat but is displaceable therefrom to release abnormal gas pressure in the cell.

15. A dry cell comprising a container, an electrode therein, an annular closure member in contact with said electrode, and an annular closure member having its outer edge secured to the upper end of said container, one of said members being relatively hard and resilient and the other of said members being relatively soft and yielding, said relatively hard and resilient member having a free edge in contact with the upper surface of said relatively soft and yielding member and being free to flex upwardly to vent gas from the cell.

16. A dry cell as defined in claim 15 in which

the closure members make substantially a line contact with each other.

17. In a dry cell having a container with a carbon electrode therein; a seat upon the upper end of said electrode; and an annular resilient metal sealing member having the outer edge thereof attached to said container by means of a fluid-tight joint, and the inner edge thereof flanged downward and forming a fluid-tight joint with said seat that is free to open by gas pressure in said cell to vent the same.

18. In a dry cell having a container with a carbon electrode therein; a relatively soft and yielding preformed washer on the upper end of said electrode; a relatively hard and resilient annular sealing member having the outer edge thereof rigidly secured to the upper end of said container and the inner edge thereof provided with a downturned flange embedded in said washer.

19. In a dry cell having a container with a carbon electrode therein; a seat upon the upper end of said electrode; and an annular resilient metal sealing member having the outer edge thereof rigidly secured to said container and the inner edge thereof flanged downward and terminating in a sharp edge embedded in said seat but adapted for being raised therefrom by gas pressure within said cell for venting the same.

20. In a dry cell having a container with a carbon electrode and an electrolyte therein; a metal dowel extending upward from said electrode; a seat comprising a washer of material impervious to said electrolyte encircling said dowel and forming a joint with said electrode through which said electrolyte will not pass; and an annular resilient sealing member having an upturned flange at the outer edge thereof over which the upper edge of said container is crimped, and a downturned flange at the inner edge thereof terminating in a sharp edge embedded in said seat but adapated for being raised therefrom by gas pressure within said cell for venting the same.

21. In a dry cell having a container with a flat-topped carbon electrode therein; a preformed flat annular disc of bibulous material impregnated with waterproofing material on the flat top of said electrode; and a dished closure of resilient metal having the outer edge thereof rigidly secured to said container so that the inner edge thereof exerts a resilient pressure on said disc, said cover being free to raise from said disc to vent excessive gases and to return to said disc to form a tight seal.

22. In a dry cell having a container; a gas-pervious waterproof carbon electrode in said container with a portion exposed to the outer atmosphere so that gas normally generated in said cell may escape therethrough; an impervious bibulous washer on the upper end of said electrode; and a sealing member of resilient metal secured under stress between the upper surface of said washer and the upper edge of said container so that the pressure of more gas than can escape through said electrode will raise the sealing member and permit escape of gas between the inner edge thereof and said washer.

23. A dry cell comprising a zinc container, a carbon electrode therein having a metal dowel projecting centrally from its upper end, a relatively soft and yielding disk mounted on said electrode and having an opening through which said dowel projects, and a relatively hard and resilient annular cover for said container, said cover having its outer edge permanently secured to the upper end of said container and its inner edge contacting with said disk yet free to flex upwardly to vent gas from the cell.

24. A dry cell comprising a zinc container, a carbon electrode therein, a metal cap mounted on the upper end of said electrode and having an outturned flange, a relatively soft and yielding washer mounted on said flange and having an opening through which said cap projects, and a relatively hard and resilient annular cover for said container, said cover having its outer edge permanently secured to the upper end of said container and its inner edge contacting with said washer yet free to flex upwardly to vent gas from the cell.

25. A dry cell according to claim 24 in which said washer consists of insulating material and said cover consists of sheet metal.

26. A dry cell according to claim 24 in which said electrode is sufficiently porous to vent gas from the cell, and the projecting part of said cap is slitted to expose a portion of said electrode to the outer atmosphere.

27. In a dry cell, a metal cup, a cartridge within said cup, an electrode arranged centrally of said cartridge, a resilient metal cover having a rigid gas-tight connection with said cup and having a central opening, a metal cap mounted on said electrode and projecting through said opening and having an annular shoulder, and an annular insulator resting on said shoulder and underlying said cover, the inner edge of said cover being turned at an angle to the remainder and pressed into sealing relation with said insulator by tension exerted solely by said cover.

28. A dry cell comprising a container electrode, an electrode member within and spaced from said container electrode; active material in the space between such electrodes; a closure for the cell comprising a metal cover member supported by said electrode member and having a marginal portion secured to said container electrode; said container electrode and said cover member consisting of dissimilar metals; and a coating of insulating material upon the interior surface of said cover member.

29. A dry cell comprising a container electrode, an electrode member within and spaced from said container electrode; active material in the space between said electrodes; a closure for the cell comprising an annular metal cover member having one margin thereof secured to said container electrode and having another margin thereof supported by said electrode member; said container electrode and said cover member consisting of dissimilar metals; and a layer of insulating material adhering to and coating the interior surface of said cover member.

30. A dry cell comprising a metal container electrode; an electrode member within and spaced from said container electrode; active material between said electrodes leaving a free space above said active material; a metal terminal cap carried by said electrode member, said cap having a portion thereof within said free space; an annular metal cover having its inner margin adjacent to but insulated from said cap and having its outer margin permanently secured to said container electrode; and a coating of insulating material upon the interior surface of said cover.

31. A dry cell comprising a container electrode, an electrode member within and spaced from said container electrode; active material in the space between said electrodes; a closure for the cell comprising a metal cover member supported by said

electrode member and having a marginal portion secured to said container electrode; said container electrode and said cover member consisting of dissimilar metals; and plastic material sealing the joint between said cover member and said container electrode.

32. A dry cell comprising a container electrode; an electrode member within and spaced from said container electrode; active material in the space between said electrodes; a closure for the cell comprising a metal cover member having a portion supported by said electrode member and having a marginal portion secured to said container electrode; said container electrode and said cover member consisting of dissimilar metals; a surface coating of insulating and protective material upon the interior surface of said cover member; and plastic material sealing the joint between said cover member and said container electrode.

33. A dry cell comprising a container; an electrode therein; a washer of a relatively soft and yielding porous material carried by said electrode with a portion thereof exposed to the outer atmosphere, the said washer being impervious to moisture but pervious to gas under the pressures developed in the cell, and a relatively hard and resilient annular impervious closure having its outer edge rigidly secured to the upper end of said container and its inner edge contacting the said washer yet free to flex upwardly to vent gas from the cell.

34. A dry cell comprising a metal container; a carbon electrode therein; a metal cap mounted on the upper end of said electrode and having an out-turned flange; a relatively soft and yielding washer mounted on said flange and having an opening through which said cap projects, the said washer being impervious to moisture but pervious to gas under pressures developed within the cell; and a relatively hard and resilient annular cover for said container, said cover having its outer edge permanently secured to the upper end of said container and its free inner edge contacting with said washer yet free to flex upwardly to vent gas from the cell.

RALPH R. SMITH.

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June 3, 1941. H. R. C. ANTHONY 2,243,938

LEAKPROOF DRY CELL

Filed March 3, 1939

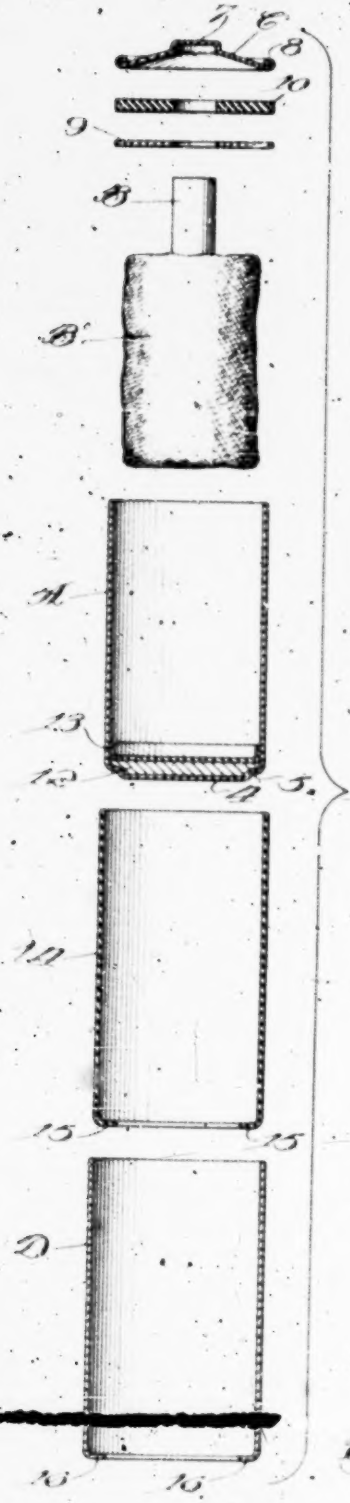


Fig. 2.

Fig. 1.

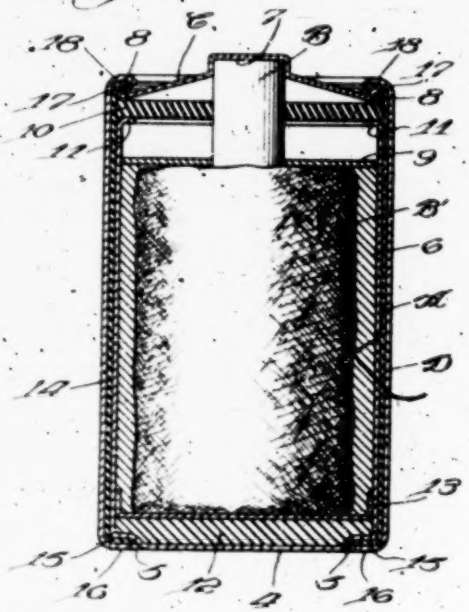
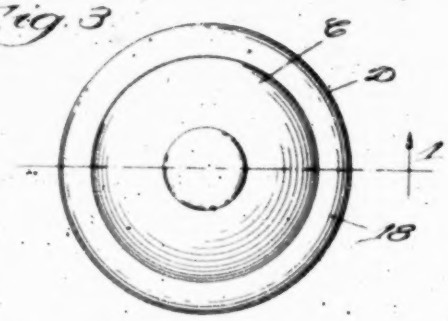


Fig. 3



Inventor:
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Patented June 3, 1941

2,243,938

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# UNITED STATES PATENT OFFICE

2,243,938

## LEAKPROOF DRY CELL

Herman R. C. Anthony, Madison, Wis., assignor to Ray-O-Vac Company, a corporation of Wisconsin

Application March 3, 1939, Serial No. 259,639

3 Claims. (Cl. 136—107)

This invention relates to dry-cells of the type used in flash light casings and the like, and more particularly to an improved metal sheath which will protect the cell from injury and will also prevent fluids from leaking out of the cell and injuring the casing or other dry-cells within the casing.

The present invention is a continuation-in-part of my application Serial No. 211,073, filed May 31, 1938.

The primary object of the present invention is to provide an improved leak-immunized dry-cell and method of manufacturing the same.

In using dry-cells it has been a common experience that if the cell is short circuited, or placed under a heavy load for a considerable length of time, the cell will expand and liquids leak out through the walls of the cell. The liquids usually include zinc chloride and ammonium chloride and will, in a short time, injure the metal walls of the casing which are commonly made of brass. If the cell is allowed to remain in the casing for a considerable length of time, it will often swell and freeze to the casing so that it is very difficult to remove it. Frequently two or more cells are used in a single casing and electrolyte leaking from one cell to another will short circuit the adjacent cell so as to destroy its usefulness and aggravate the damage to the casing.

Flash light cells usually are manufactured with a wax coated disk in the bottom part of the cell or cup which partially embraces the end of the depolarizing-mix and retards the action of the electrolyte on the bottom wall of the cup. As a result of this protection, the cup usually gives out first at its side walls, slightly above the bottom, and this is where the electrolyte is most likely to leak out after the cell has been in use for a long period. By protecting the side walls of the cup, most of the danger of leakage is avoided, but in some cases it is desirable to provide additional protection for the bottom and top of the cell.

Another object of the present invention is to provide a strong metal sheath which will closely and rigidly confine the cell to a given length and diameter. It has been found that without such protection cells frequently swell so much in diameter that they stick in the casing and sometimes elongate sufficiently to damage the casing. The zinc commonly used as an electrode and as a cup for the electrolyte is too weak by itself to prevent such action.

Another object of the invention is to provide a strong metal sheath or jacket which may be insulated from both terminals of the cell so that it will be unnecessary to use an insulating cover or label to prevent the cell from short circuiting on the side walls of the casing.

Another object of the invention is to provide additional protection for the bottom wall of the zinc cup and to protect the metal top closure from the corrosive action of the chemicals in the cell.

Still another object of the invention is to provide an improved hood or cap for the top of the cell and a compressive insulating washer which not only protects the hood from chemical action but serves as a cushion whereby the metal sheath may draw the hood firmly against the top of the cell and form a seal which is practically air tight.

The invention is illustrated in preferred embodiments in the accompanying drawing, in which—

Figure 1 is a vertical sectional view of a dry cell embodying the invention, taken as indicated at line 1 of Figure 3; Figure 2, an exploded view of various parts which go into the assembly; and Figure 3, a top plan view of the completed cell.

In the embodiment illustrated, A designates a zinc cup which serves as a negative electrode for the cell; B, a carbon electrode provided with a depolarizing-mix B'; C, a metal hood or top closure for the cell; and D, a metal sheath which encloses the cell.

The cup A preferably has a downwardly extending boss 4 surrounded by an annular shoulder 5 which is gripped by a flange of the steel jacket in the completed cell, leaving the end of the boss flush with the end of the jacket.

The upwardly extending carbon pole B and the depolarizing-mix B' are of the usual construction. The depolarizing-mix is submerged in electrolyte 6 which usually is jelled by placing the cell in hot water after the positive electrode has been inserted.

The cap C is made of metal and has a socket 7 which fits snugly over the upper end of the carbon pole B. The peripheral portion of the cap is curled inwardly, as indicated at 8, to form a bead which is gripped by the metal sheath in the final operation. Several safeguards are provided to prevent the chemicals within the cell from attacking and corroding the metal hood. A paraffin coated washer 9 is slipped down over the carbon pole B, and a rather heavy asphalt top washer 10 snugly fits around the pole B and is interposed between the bead 8 and an inturned

flange 11 on the top of the zinc cup A. This washer is somewhat compressible so that a very tight fit may be obtained. An additional safeguard is a protective coating applied to the underside of the hood C outside of the socket 7. While heretofore caps for the carbon pole have been usually made of brass, it is found that other stronger metals may be used. If the material is ferrous, it is desirable to give the underside a plating which may be 80% lead and 20% tin. Various acid resistant paints are available and can be used on the underside of the hood to further protect it.

An improved method of manufacture has been developed which will now be described. The electrode A is first drawn in the usual cup form. A rather thick asphalt washer 12 is then placed in the bottom of the cup and the cup is then placed in a die which forms the boss 4 and shoulder 5. If desired, a paper washer 13 may be placed over the asphalt washer 12 to prevent the plunger of the die from sticking to the asphalt. The placing of the asphalt washer in the bottom of the can before the final stamping operation has several advantages. It is sufficiently yielding to cause the bottom of the can to accurately follow the shape of the female die without excessive strain on the metal, and the pressing operation insures a perfect fit between the washer and the bottom of the cell. This eliminates any possibility of corrosive material working down between the washer and the bottom of the cell.

The next step is to pour the electrolyte into the cell and introduce the carbon pole B with the depolarizing-mix B'. The latter operation will cause the electrolyte to well-up around the depolarizing-mix and the electrolyte is usually then subjected to heat which causes it to set as a kind of paste. If desired, the paraffin washer 9 may then be placed in the top of the can and the top marginal portion of the can is turned inwardly to form the flange 11 upon which the compression washer 10 is to rest.

An insulating sheet 14 of tubular form, having an open bottom and an inturned end flange 15, is then slipped over the cell, and this assembly is inserted into the metal sheath D which also has an open bottom and an end flange 16.

The asphalt top washer 18 is then forced over the carbon pole B and brought to rest on the flange 11 of the zinc cup. The socket 7 of the hood C is next fitted over the end of the carbon pole and the bead 8 brought to bear against the outer edge portion of the washer 18. The top edge of the sheath 14 is then turned inwardly over the bead 8, as indicated at 17, and a top marginal portion 18 of the sheath D is then crimped over the bead 8 and paper flange 17. The latter action draws the assembly together firmly so that the cell is practically air tight. It may be noted that the sheath D is insulated from both electrodes. This is accomplished by the insulating sheet 14 with its end flanges 15 and 17. Of course, the order of steps when producing the cell may be varied in order. For example, the tubular insulating sleeve 14 might be inserted in the sheath D before the cup A is inserted. However, the indicated sequence of steps is the preferred one.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, for some modifications will be obvious to those skilled in the art.

I claim:

1. A leak-immunized cell provided with circuit terminals at opposite ends, comprising: a cup-shaped metal electrode having an inwardly extending top flange containing electrolyte; a carbon electrode and depolarizing-mix in said electrolyte; a compression washer snugly impaled by said carbon electrode and resting on said flange; a metal hood forming a closure for the cell and a terminal for said carbon electrode, the marginal portion of said hood being curled upwardly and inwardly to form a bead resting upon the outer marginal edge portion of said washer; a sheet of insulating material enclosing the side wall of the cell and marginal edge portions of both the hood and bottom of said cell; and a protecting metal sheath electrically insulated from both of the electrodes and surrounding said insulating sheet and gripping it firmly against the lower portion of the cell and the upper curved surface of the bead.

2. A leak-immunized cell provided with circuit terminals at opposite ends, comprising: a hollow metal electrode containing electrolyte; a carbon electrode and depolarizing-mix in said electrolyte; a metal hood insulated from said metal electrode and forming a closure for the cell and a terminal for said carbon electrode, the marginal portions of said hood being curled upwardly and inwardly to form a bead; a sheet of insulating material enclosing the side wall of the cell and marginal edge portions of both the hood and bottom of said cell; and a protecting metal sheath electrically insulated from both of the electrodes and surrounding said insulating sheet and gripping it firmly against the lower end of the cell and the upper curved surface of the bead.

3. A dry-cell as specified in claim 2, in which a plastic insulating disk is provided, snugly fitting around the carbon electrode, and gripped between the marginal portions of the hood and top of the metal electrode.

HERMAN R. C. ANTHONY

# PATENT SPECIFICATION

237

Application Date: May 17, 1934. No. 14904/34.

Complete Specification Left: May 16, 1935.

Complete Specification Accepted: Nov. 18, 1935.

438,663

## PROVISIONAL SPECIFICATION

## Improvements relating to Dry Type Electric Batteries

We, ROYDON MORRISON BLOMFIELD, a British Subject, and FULLER ACCUMULATOR CO. (1926) LIMITED, a British Company, both of Woodland Works, Grove Road, Chadwell Heath, Essex, do hereby declare the nature of this invention to be as follows:—

This invention relates to dry type electric batteries or cells of the type comprising a zinc container or cylinder with a central carbon electrode and the usual materials therein for the production of electric energy by chemical action and has for its object to provide an improved closure for the cell which obviates the necessity for sealing with a bitumen or other composition, facilitates and expedites the production of the complete cell, gives an improved appearance to the cell and provides in a convenient manner for the ready escape of gas generated in the cell.

In accordance with our present invention, the closure comprises a cylindrical part and a disc at one end thereof with a central aperture therein through which the central electrode projects, the latter having an insulating washer thereon above the active materials of the cell. The disc may be formed integrally with the cylindrical part of the closure or may be separate therefrom and come beneath an inwardly turned lip or flange upon the upper end of the cylinder. When a separate disc is used, this may be made of any suitable insulating material such as metal with an insulation coating, pulpboard, strawboard, fibre, ebonite or synthetic resin.

The zinc cup is a fit within the cylindrical part of the closure and such cylindrical part with the integral or separate end disc provides a complete closure for the cell, covering in and protecting the same in an efficient and neat manner. The bottom of the zinc cup is left exposed as usual but the cylindrical part of the closure may be turned in at its bottom edge beneath the zinc cup if desired to prevent disengagement of the cup from the closure.

The closure may be made of waxed or unwaxed pulp board straw board, fibre, ebonite, synthetic resin or other similar insulating material and provides a convenient surface for the attachment of labels for information and advertising services.

If desired the insulation washer upon the central electrode may be correctly located thereon by pressing an inwardly projecting ring on the zinc cup upon which the washer can rest.

The gas generated in the cell can readily escape around the central electrode where the latter passes through the end disc portion of the closure.

Dated this 5th day of May, 1934.

MARKS & CLERK.

## COMPLETE SPECIFICATION

## Improvements relating to Dry Type Electric Batteries

We, ROYDON MORRISON BLOMFIELD, a British Subject, and FULLER ACCUMULATOR CO. (1926) LIMITED, a British Company, both of Woodland Works, Grove Road, Chadwell Heath, Essex, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to dry type electric batteries or primary cells of the type comprising a central carbon electrode and a container for the usual materials for the production of electric energy by chemical action and has for its object to provide an improved closure for the cell which obviates the necessity for sealing with a bitumen or other composition, facilitates and expedites the production of the complete cell, gives an improved appearance to the cell and provides in a convenient manner for the ready escape of gas generated in the cell.

The invention comprises a closure for the container in the form of a cylinder of insulating material with a disc at one

[Price 1/-]

end thereof with a central aperture therein through which the central electrode projects, the disc being either integral with or separate from the closure, and in the latter case coming beneath an inwardly turned lip or flange upon the upper end of the closure, a second disc or washer surrounding the central electrode below the first mentioned disc but above the active material in the cell and insulating material being provided in the space between the two discs.

The invention further comprises the provision of an inwardly turned ring or ledge upon the container to locate correctly the said second disc or washer upon the central electrode.

Referring to the accompanying sheet of explanatory drawings:—

Figure 1 is a sectional view of a battery with its closure constructed in one convenient form in accordance with this invention.

Figure 2 is a sectional view of the cylindrical closure only of Figure 1.

Figure 3 is a sectional view of a battery with a modified construction of closure in accordance with this invention.

Figure 4 is a sectional view of the closure of Figure 3 before the container is placed therein.

The closure for the container *g* comprises a cylindrical part *a* and a disc *b* at one end thereof with a central aperture *b*' therein through which the central electrode *c* projects, the latter having an insulating washer *d* thereon above the active materials *e* of the cell. The said central electrode has a metal cap *c*' upon its end. The disc *b* may be formed integrally with the cylindrical part of the closure as shown in Figures 3 and 4 or may be separate therefrom as shown in Figures 1 and 2 and come beneath an inwardly turned lip or flange *f* upon the upper end of the cylinder. When a separate disc *b* is used, this may be made of any suitable insulating material such as metal with an insulation coating, pulpboard, strawboard, fibre, ebonite or synthetic resin.

The zinc container *g* is a fit within the cylindrical part *a* of the closure and such cylindrical part with the integral or separate end disc *b* provides a complete closure for the cell, covering in and protecting the same in an efficient and neat manner. The bottom of the zinc cup is left exposed as usual but the cylindrical part of the closure may be turned in at its bottom edge as shown in Figure 3 beneath the zinc cup if desired to prevent disengagement of the cup from the closure.

The closure *a* may be made of waxed or unwaxed pulpboard, strawboard, fibre, ebonite, synthetic resin or other similar insulating material and provides a convenient surface for the attachment of labels for information and advertising services.

The space between the two discs *b* and *d* is filled in with an insulating material.

If desired, and as shown in Figure 3 the insulating washer *d* upon the central electrode may be correctly located thereof by pressing an inwardly projecting ring or ledge *h* on the zinc cup *g* upon which the washer can rest.

The gas generated in the cell can readily escape around the central electrode where the latter passes through the end disc portion *b* of the closure.

It is known to encase a dry cell of the type described with regenerated cellulose which closely surrounds the central electrode and forms a seal at the top of the cell. It is also known to provide a layer of insulating material below the seal of a pitch-sealed cell.

This invention however has no reference to pitch sealed cells. Nor does the invention include cells of the type formed in two sections which require to be telescoped together before the cell is brought into use to bring the electrolyte into contact with the electrodes.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A dry electric battery of the type specified having a closure for the container in the form of a cylinder of insulating material with a disc at one end thereof with a central aperture therein through which the central electrode projects, the disc being either integral with or separate from the closure, and in the latter case coming beneath an inwardly turned lip or flange upon the upper end of the closure, a second disc or washer surrounding the central electrode below the first mentioned disc but above the active material in the cell and insulating material being provided in the space between the two discs.

2. In a dry electric battery as claimed in any of the preceding claims, the provision of an inwardly turned ring or ledge upon the container to locate correctly the second disc or washer upon the central electrode.

3. The improved dry electric batteries of the type specified, substantially as described and as illustrated in the accompanying drawings.

Dated this 1st day of May, 1935.

MARKS & CLERK.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1935.

438,663 COMPLETE SPECIFICATION

1 SHEET

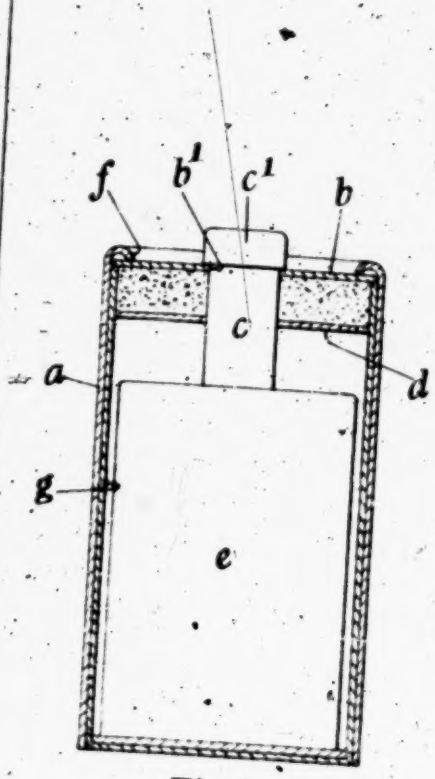


Fig.1

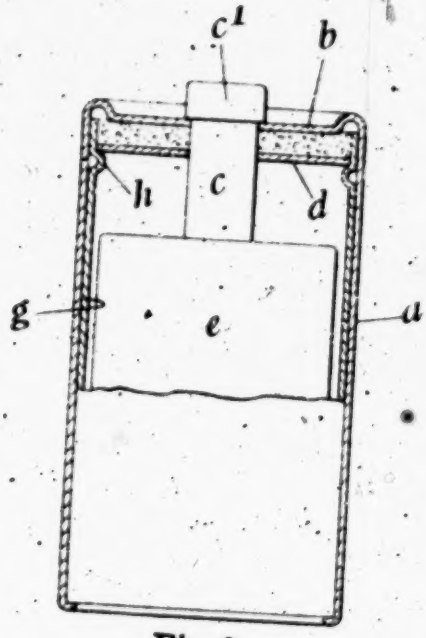


Fig.3

Fig.2

Fig.4

[This Drawing is a reproduction of the Original on a reduced scale.]

Malby & Sons, Photo-Lith

295 CERTIFIED COPY.

United States of America,
Eastern District of Illinois. } ss:

I, D. H. Reed, Clerk of the United States District Court in and for the Eastern District of Illinois, do hereby certify that the annexed and foregoing is a true correct, full and complete transcript of the record and proceedings, in a cause entitled Ray-O-Vac Company *vs.* The Goodyear Tire & Rubber Company, Inc. and General Dry Batteries, Inc., in Civil Action No. 240-D, as fully as the same appears from the originals now on file and of record in my office as Clerk of said Court, and made in accordance with "Designation of Contents of Record On Appeal, filed by Appellee.

I further certify that the Report of Proceedings at the Trial herein is the original Report of Proceedings at the Trial.

In Testimony Whereof, I have hereunto subscribed my name and affixed the seal of the aforesaid Court at Danville this 15th day of September, A. D. 1942.

(Seal)

D. H. Reed,
*Clerk.*
By Marie Burnett,
*Deputy Clerk.*

UNITED STATES CIRCUIT COURT OF APPEALS

For the Seventh Circuit.

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I, Kenneth J. Carrick, Clerk of the United States Circuit Court of Appeals for the Seventh Circuit, do hereby certify that the foregoing Printed pages contain a true copy of the printed record, printed under my supervision and filed on the seventeenth day of November, 1942, in

Cause No. 8118.

Ray-O-Vac Company,
*Plaintiff,*

*vs.*

The Goodyear Tire & Rubber Company, Inc.,
*Defendant,*

and

General Dry Batteries, Inc.,
*Defendant-Intervenor,*

as the same remains upon the files and records of the United States Circuit Court of Appeals for the Seventh Circuit.

In Testimony Whereof I hereunto subscribe my name and affix the seal of said United States Circuit Court of Appeals for the Seventh Circuit, at the City of Chicago, this 2nd day of July, A. D. 1943.

Kenneth J. Carrick,
(Seal) *Clerk of the United States Circuit Court of Appeals for the Seventh Circuit.*

At a regular term of the United States Circuit Court of Appeals for the Seventh Circuit, held in the City of Chicago, and begun on the sixth day of October, in the year of our Lord one thousand nine hundred and forty-two, and of our Independence, the one hundred and sixty-seventh.

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Ray-O-Vac Company,
*Plaintiff,*
8118 *vs.*
The Goodyear Tire & Rubber Company, Inc.,
*Defendant,*
and
General Dry Batteries, Inc.,
*Defendant-Intervenor.*

} Appeal from the District Court of the United States for the Eastern District of Illinois, Northern Division.

---

And, to-wit: On the twenty-ninth day of September, 1942, there was filed in the office of the Clerk of this Court, an appearance of counsel for appellants, which said appearance is in the words and figures following, to-wit:

UNITED STATES CIRCUIT COURT OF APPEALS

For the Seventh Circuit.

Cause No. 8118.

The Goodyear Tire & Rubber Company, Inc. and General Dry Batteries, Inc.,
*Appellants,*

*vs.*

Ray-O-Vac Company,
*Appellee.*

The Clerk will enter our appearance as counsel for Appellants.

William E. Chilton,
1022 Leader Bldg.,
Cleveland, Ohio.
Albert R. Golrick,

---

And afterwards, to-wit: On the twenty-third day of October, 1942, there was filed in the office of the Clerk of this Court, an appearance of counsel for appellees, which said appearance is in the words and figures following, to-wit:

UNITED STATES CIRCUIT COURT OF APPEALS

For the Seventh Circuit.

Cause No. 8118.

Ray-O-Vac Company,

*vs.*

The Goodyear Tire & Rubber Company, Inc.

The Clerk will enter our appearance as counsel for Ray-O-Vac Company.

Bernard A. Schroeder,
141 W. Jackson Blvd.,
Chicago.
Russell Wiles,
141 W. Jackson Blvd.,
Chicago.

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And afterwards, to-wit: On the nineteenth day of April, 1943, the following further proceedings were had and entered of record, to-wit:

Monday, April 19, 1943.

Court met pursuant to adjournment.

Before:

Hon. Evan A. Evans, Circuit Judge.
Hon. Will M. Sparks, Circuit Judge.
Hon. J. Earl Major, Circuit Judge.

8118

Ray-O-Vac Company,
*Plaintiff.*
*vs.*
The Goodyear Tire & Rubber Company, Inc.,
and
General Dry Batteries, Inc.;
*Defendant-Intervenor.*

Appeal from the District Court of the United States for the Eastern District of Illinois, Northern Division

Now this day come the parties by their counsel, and this cause comes on to be heard on the transcript of the rec-

ord and briefs of counsel, and on oral argument by Mr. William E. Chilton, counsel for appellants, and by Mr. Bernard A. Schroeder and Mr. Russell Wiles, counsel for appellee, and the Court takes this matter under advisement.

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And afterwards, to-wit: On the fifth day of June, 1943, there was filed in the office of the Clerk of this Court, the Opinion of the Court, which said Opinion is in the words and figures following, to-wit:

IN THE UNITED STATES CIRCUIT COURT OF APPEALS

For the Seventh Circuit.

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**No. 8118.** **October Term, 1942, April Session, 1943.**

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**RAY-O-VAC COMPANY,**
*Plaintiff-Appellee,*
vs.
**THE GOODYEAR TIRE & RUBBER COMPANY, INC.,**
*Defendant-Appellant,*
and
**GENERAL DRY BATTERIES, INC.,**
*Defendant-Intervenor-Appellant.*

Appeal from the District Court of the United States for the Eastern District of Illinois.

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**June 5, 1943.**

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Before EVANS, SPARKS, and MAJOR, *Circuit Judges.*

EVANS, *Circuit Judge.* This appeal involves the validity and infringement of a patent to Anthony (assignor of plaintiff) issued April 23, 1940, No. 2,198,423, and covering a "Leakproof Dry Cell." The court found for the plaintiff on both issues, validity and infringement. From an injunctional decree, which also ordered an accounting, defendant prosecutes this appeal and renews the arguments made by it in the District Court in the hopeful belief that we will not agree with the conclusions which that court reached. While arguing both points, its most vigorous urge is directed to the defense of non-infringement.

The court found the patent to be valid and infringed. There was considerable oral testimony given as to the wide

acceptance of the product immediately following its appearance on the market. The extent to which such acceptance was traceable to the patent and not to the advertising or other efforts of the plaintiff, was essentially a fact question, upon which the District Judge's findings are entitled to great weight. Moreover, the effect of such acceptance and the extent of the acceptance, in a doubtful case, is a factor at times well nigh decisive of the issue of validity. Such evidence bore directly upon the plaintiff's contention that the invention was not obvious. It was but an application of Justice Holmes' observation,—"The life of the law has not been logic; it has been experience." The acceptance of a new article of commerce is experience which may well outweigh any conclusion of the court or any syllogism which concludes,—there is nothing to that dry cell which any mechanic did not foresee. The public appraisal of a new article's worth, evidenced by its prompt acceptance, outweighs, in some cases, a volume of opinion evidence given by professional experts.

In other words, the issue as to whether the invention covered by the patent in suit represented a patentable advance in the art, was in part a strictly factual one, upon which much evidence was received, and a finding thereon was made by the District Court. We accept the finding of the District Court on this, in part, factual issue of immediate and extensive use which followed the appearance of the patented dry cell.

With these observations little more need be said respecting the validity of this patent. It covered dry cells of the ordinary type used in flash lights. The novelty consisted of making a cell which was leakproof and swell proof, or more nearly so than those heretofore used.

It was widely recognized that leakage of corrosive or electrolyte from exhausted cells and damage to flash light casings from such leakage and the resulting swelling of the old cells have plagued those working in this industry from the time the first dry cell appeared.

Anthony's patent is devoted to the prevention of leakage in a cell and the swelling in dry cells. He claims to have accomplished this result "by providing a steel jacket for the side walls of the zinc cup, which grips the end closures with sufficient mechanical strength to withstand not only any gas pressure developed but also the mechanical pressure of expanding solids in the cell which form as the zinc is used up."

The trial judge, in commenting upon the evidence and the working of the structure, said:

> "There is no question under the evidence that the additional element overcame these two trouble makers or that Anthony by his combination solved the problem, not by preventing leakage absolutely but by reducing it to such a minimum as to remove almost entirely the prevalent troubles."

While unprepared to say the "trouble makers" were overcome, we do say the evidence tends to establish the fact that the "trouble makers" were less troublesome in Anthony's cells than they were in the cells in common use before Anthony's invention.

We accept the District Court's conclusion that the claims in suit are valid. In reaching this conclusion our only doubt has arisen from the presence of such a multitude of inventions in so narrow a field. It is doubtful if any field of such narrow scope can be found where the inventive genius evidences such guinea pig prolificity.

In the brief period, 1935 to 1941, Anthony secured three patents on leakproof dry cells. Although counsel argue that he attained well nigh perfection in dry cells in the patent in suit, he secured a patent a year later dealing generally with the same subject matter. Notwithstanding this reflection on the asserted success and acceptance of its cell, we hold that the patent is valid.

*Infringement.* We think it fair to say that defendant's chief reliance is upon non-infringement. We set forth the exact language of claim.* Claims 2 and 3 provide for

* Claim 1 reads:

"A leak-immunized flashlight dry-cell provided with

"(1) circuit terminals

(a) at opposite ends, comprising:

"(2) a hollow cylindrical zinc metal electrode containing electrolyte;

"(3) a centrally disposed carbon electrode and

"(4) depolarizing-mix in said electrolyte;

"(5) a bottom closure for the cell affording a terminal for one of the electrodes;

"(6) a top closure for the cell provided with a terminal for the other electrode,

(a) electrically insulated from the first mentioned terminal; and

"(7) a protecting sheet-metal sheath insulated from both of said electrodes and

(a) enclosing the side walls of said metal electrode and

(b) tightly embracing said closures so as to prevent leakage of the electrolyte from the unit."

an additional element, to claim 1. If we conclude claim 1 is not infringed, it follows that claims 2 and 3 are likewise not infringed. Inasmuch as there is no contention over the added elements appearing in claims 2 and 3, it also follows that if infringement of claim 1 is shown, the finding of infringement of claims 2 and 3 is shown.

Non-infringement of claim 1 rests upon the asserted absence of element 5, to-wit, "a bottom closure for the cell affording a terminal for one of the electrodes."

The asserted difference between the two cells is in the bottom. Defendant contends that element 5 necessitates a separate and distinct bottom closure. The defendant's device, so it points out, has a heavier bottom wall, but not a separate one. Its bottom of the zinc cup is the same thickness as its walls and is made of steel. The precise question upon which infringement turns is whether element 5 calls for an extra or double bottom. Or, is infringement lacking if the "bottom closure" is formed integrally with the zinc electrode?

On this issue, the controversy becomes a narrow one and, we may add, also a close, a doubtful one.

Our final conclusion is that it would be adding modifying and restricting words, not justified by the language of the claim and the heart of this invention, to hold that this element 5 requires two bottoms or that the extra strengthened bottom of the defendant does not meet element 5, or that said element does not read upon the extra heavy bottom of defendant's structure.

The decree is

AFFIRMED.

And on the same day, to-wit: On the fifth day of June, 1943, the following further proceedings were had and entered of record, to-wit:

Saturday, June 5, 1943.

Court met pursuant to adjournment.

Before:

Hon. Evan A. Evans, Circuit Judge.
Hon. Will M. Sparks, Circuit Judge.
Hon. J. Earl Major, Circuit Judge.

8118

Ray-O-Vac Company,
*Plaintiff*,
*vs.*
The Goodyear Tire & Rubber Company, Inc.,
*Defendant*,
and
General Dry Batteries, Inc.,
*Defendant-Intervenor.*

Appeal from the District Court of the United States for the Eastern District of Illinois, Northern Division.

This cause came on to be heard on the transcript of the record from the District Court of the United States for the Eastern District of Illinois, and was argued by counsel.

On consideration whereof, it is ordered and adjudged by this Court that the judgment of the said District Court in this cause appealed from be, and the same is hereby affirmed, with cost.

And afterwards, to-wit: On the twenty-fifth day of June, 1943, there was filed in the office of the Clerk of this Court, a Motion to Stay Mandate, which said Motion is in the words and figures following, to-wit:

IN THE UNITED STATES CIRCUIT COURT OF APPEALS

For the Seventh Circuit.

| | |
|---|---|
| Ray-O-Vac Company,<br>*Plaintiff-Appellee,*<br>*vs.*<br>The Goodyear Tire & Rubber Company, Inc.,<br>*Defendant-Appellant,*<br>and<br>General Dry Batteries, Inc.,<br>*Defendnt-Intervenor-Appellant.* | Appeal No. 8118. |

MOTION TO STAY MANDATE.

Now come The Goodyear Tire & Rubber Company, Inc., Defendant-Appellant, and General Dry Batteries, Inc., Defendant-Intervenor-Appellant, and move the Court to stay the issuance of the mandate in this cause for a period of forty-five (45) days from June 5, 1943, in order that Defendants may, within such time, file a Petition for Writ of Certiorari with the Supreme Court of the United States.

William E. Chilton,
*Attorney for Defendants-Appellants.*
William E. Chilton,
1022 Leader Building,
Cleveland, Ohio

June 24, 1943
It Is So Ordered:

*U. S. Circuit Judge.*

Copy of the above Motion was this day sent by first class registered mail to Bernard A. Schroeder, Esq., 2800 Board of Trade Building, Chicago, Illinois, Attorney for Plaintiff-Appellee.

William E. Chilton.

And on the same day, to-wit: On the twenty-fifth day of June, 1943, the following further proceedings were had and entered of record, to-wit:

Friday, June 25, 1943.

Court met pursuant to adjournment.

Before:

Hon. Evan A. Evans, Circuit Judge.

8118

Ray-O-Vac Company,
*Plaintiff,*
*vs.*
The Goodyear Tire & Rubber Company, Inc.,
*Defendant,*
and
General Dry Batteries, Inc.,
*Defendant-Intervenor.*

Appeal from the District Court of the United States for the Eastern District of Illinois, Northern Division.

On motion of counsel for defendant-appellant and defendant-intervenor-appellant, it is ordered that the issuance of the mandate of this Court be stayed for a period of forty-five days from June 5, 1943.

UNITED STATES CIRCUIT COURT OF APPEALS

For the Seventh Circuit.

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I, Kenneth J. Carrick, Clerk of the United States Circuit Court of Appeals for the Seventh Circuit, do hereby certify that the foregoing Printed pages contain a true copy of the proceedings had and papers filed, excepting briefs of counsel and motions and orders extending time for filing briefs, in:

Cause No. 8118.

Ray-O-Vac Company,
*Plaintiff,*

*vs.*

The Goodyear Tire & Rubber Company, Inc.,
*Defendant,*

and

General Dry Batteries, Inc.,
*Defendant-Intervenor,*

as the same remains upon the files and records of the United States Circuit Court of Appeals for the Seventh Circuit.

In Testimony Whereof I hereunto subscribe my name and affix the seal of said United States Circuit Court of Appeals for the Seventh Circuit, at the City of Chicago, this 2nd day of July, A. D. 1943.

(Seal)

Kenneth J. Carrick,
*Clerk of the United States Circuit Court of Appeals for the Seventh Circuit.*

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SUPREME COURT OF THE UNITED STATES

ORDER ALLOWING CERTIORARI—Filed October 18, 1943

The petition herein for a writ of certiorari to the United States Circuit Court of Appeals for the Seventh Circuit is granted.

And it is further ordered that the duly certified copy of the transcript of the proceedings below which accompanied the petition shall be treated as though filed in response to such writ.